सत्यमेव जयते

REPORT
ON
MINOR IRRIGATION WORKS
(ORISSA STATE)

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COMMITTEE ON PLAN PROJECTS/
(IRRIGATION TEAM)
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LETTER OF TRANSMITTAL

M. Thirumala Rao, M.P.,
Leader,
Irrigation Team.

Link House,
3-Mathura Road,
New Delhi.
February 27, 1965.

My dear NANDA JI,

Irrigation Team has completed its studies of minor irrigation works in Orissa and a report thereabout is submitted herewith for your perusal.

Average annual rainfall in the State is about 58 inches. This normally enables a single rice crop to mature satisfactorily. For such single crop raising, need for irrigation is felt only when there is longish break in monsoon.

Population being sparse the State is generally surplus in rice. But, from its land and water resources Orissa can contribute much more to the national production effort, if double cropping is practised increasingly with the help of irrigation for which possibilities exist in the State both from surface and subsoil sources.

Unfortunately, the single crop concept is rooted so deeply in Orissa peasantry that even irrigation works that exist, are used mostly as supplemental means of irrigation for maturing just one crop. Advantage is generally not taken to raise a second crop with their help. Consequently, minor irrigation works are not looked after well and storage capacities of some of the old tanks in the State have depleted considerably over years.

No recording of irrigation and water rate assessment on minor irrigation works is done in the State. The exact utilisation extent of the irrigation potential available could not, therefore, be assessed. But actual commands of 80 projects re-surveyed recently by the State Rural Engineering Organisation showed that the projects could render service to only 77 per cent of the areas otherwise shown in their ayacuts. This too may not be getting irrigation adequately and properly as no water channels exist.

Again, deep tubewells sunk in the coastal districts of Balasore and Cuttack have not been utilised even partially. Of 21 tubewells built, only 9 Nos. were functioning during 1962-63. Over the year, their average irrigational performance works out to only 26 acres per tubewell, which is too low a figure. Apparently, the cultivators have not been pushed hard enough to produce more, even from such ready-at-hand irrigation resources as tubewells provide.

A common complaint, which inhibits progress in the field of agricultural development even in areas protected by irrigation works is the time old menace of letting cattle loose during winter months. Effective enforcement of Cattle Trespass Act is called for to achieve security of crops from cattle trespass damage. Possibly, if winter crop planning is initiated with cattle fodder and forage crops, a headway could be made in agricultural development during post-monsoon period.

A new scheme of lift irrigation from floating barges has recently been put into operation on some of the perennial streams. This could prove beneficial to the areas served, if the organisational set-up is judiciously formed, so that the scheme does not flounder on the frailties that generally encompass our human front.

Observations of the Team and its recommendations as incorporated in this report aim at maximising production from irrigated agriculture and will undoubtedly prove helpful in planning, progressing, executing and maintaining irrigation works—more particularly small schemes and wells.

I take this opportunity of expressing our thanks to the State Government and their officers for providing facilities for at-site studies of works and for extending to us their co-operation.

With best regards,

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Yours sincerely,

M. THIRUMALA RAO

Shri G. L. Nanda,
Home Minister, Govt. of India
New Delhi.

PREFACE

Study of Minor Irrigation Works in Orissa State was taken up by the Irrigation Team, Committee on Plan Projects, Planning Commission, in accordance with the Terms of Reference communicated vide Committee on Plan Projects Memorandum No. COPP/(4)/17/58, dated the 4th August, 1958 given on Pages 67-68 of this report.

The Team comprised: —

(i) Shri Thirumala Rao, M.P.—*Leader.*

(ii) Shri Baleshwar Nath, Chief Engineer—*Member.*

(iii) Dr. Arjan Singh, Retd. Director of Agriculture, Punjab—*Member.*

(iv) Shri Mahavir Prasad, Irrigation Adviser, Ministry of Food & Agriculture—*Member Ex-officio.*

After preliminary discussions on March 17, 1962 at Bhubneshwar, proceedings of which appear in *Appendix* I, field studies were initiated by the Leader. The Team subsequently toured in different parts of the State and conducted at-site studies on representative irrigation works, of both pre-Plan and post-Plan periods.

The studies conducted primarily aimed at getting techno-economic appraisal of the works, as also of their maintenance, irrigational performances and overall benefits accruing to the community.

The Team has had discussions with the State authorities at appropriate levels on different aspects of irrigated agriculture in the State. Another meeting was held at Bhubneshwar on August 6, 1963 between the Leader and Members of the Team and the State Deputy Chief Minister and other officers. Various issues as emerged out of field studies were then discussed. Its proceedings appear in *Appendix* II.

Comments of the State Government on the Draft Report as received *vide* Plan and Coordination Department Letters No. 2353(Coord), dated 6th April, 1965 and 4270/Coord/M.I.P.—Misc/88/64, dated 25th May, 1965 have been taken into consideration while finalising the Report. Observations of the Team and their recommendations thus reflect by and large, agreed views of the Team and the State Government.

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CHAPTER I

General

1.1. The State of Orissa comprises jurisdictional units, inheriting administrative procedures and revenue systems of different States namely Bengal, Bihar, Central Provinces and Madras, as also of 23 princely States, which merged with it in 1948-49. This conglomerate complexion is amply reflected in the organisation, up-keep and maintenance of its irrigation schemes also more particularly minor irrigation works.

1.2. Present day Orissa extends over an area of 6,164 square miles. It has a coastal line of about 400 kilometer (250 miles) along the Bay of Bengal. It lies between North latitude 17°—50′ to 22°—34′, and East longitude 81°—27′ to 87°—29′.

PHYSICAL FEATURES

1.3. The State can be divided physically into four well-defined regions. Each of these regions has its distinguishing characteristics.

(*a*) *Northern Plateau*—This is traversed by Brahmani and Vaitarni rivers. Starting from the hills sloping towards the Bay of Bengal on the East it comprises forested hills of Mayurbhanj, Keonjhar, Dhenkanal and Sundargarh districts. This plateau is richly endowed with minerals. Dharwar rocks of Mayurbhanj, Keonjhar, and Sundargarh districts are good source of iron ore and manganese deposits. Gondwana rocks of Talcher have large deposits of coal. Besides, lime-stone, chromite, dolomite are also found in this plateau. Agriculturally however, this is a backward area.

(*b*) *Eastern Ghats*—This region extends over the districts of Koraput, Kalahandi and Ganjam and follows the right bank of Mahanadi. The region has up-land plateau and hills and valleys which are fertile. It has mineral resources of manganese and graphite. Agriculturally the area, so far, is ill-developed.

(*c*) *Central Tract*—This comprises Bolangir, Sambalpur and Dhenkanal districts and has some fertile stretches. River Mahanadi and its tributaries traverse this tract.

(*d*) *Coastal Plain*—This is the most fertile alluvial deltaic stretch bordering on the Bay of Bengal. Figure 1.1, illustrates the soil classification of the State.

RAINFALL

1.4. Orissa has a fairly good annual rainfall ranging from 50 to 65 inches. Nearly three fourth of it, is brought by the monsoons during the months of June to September, varying from district to district. Monthwise average rainfall based on 50 years data (1901 to 1950) is given in *Appendix* III. Isohyetal map of the State (Figure 1.2) indicates its general distribution. Fair amount of precipitation, about 4.5 inches, is also received in October which can provide adequate moisture for sowing of *rabi* crops.

POPULATION

1.5. The population of the thirteen districts of Orissa as per 1961 census was 17,548,846 (18 millions in round figures). The decade 1951—61 has shown an increase of 19.82 per cent. (1.98 per cent., per annum). The 1951 census counts stood at 14,645,946. The density of population per square mile in the State as a whole is 292. While the district of Cuttack has the highest density of population of 722, that of Phulbeni is 120. About 24 per cent. of the population belongs to scheduled tribes (*Adivasi*). They have been depending mostly for their livelihood on the forest produce, and shifting cultivation of primitive type.

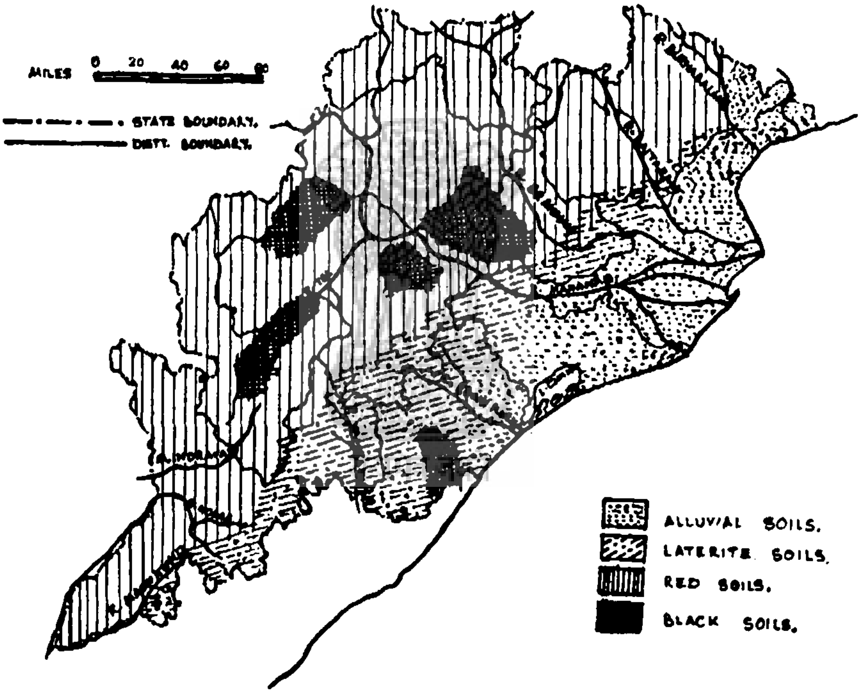

Fig. 1.1. *Soil map of Orissa State*

1.6. Though agriculture accounts for 70 per cent of the working force of the State, yet agricultural productivity both in terms of value of output per engaged person and per acre of cultivated land, is low. The State is practically one crop State partly because its agricultural operations are generally exposed to the vagaries of nature like floods, droughts and cyclones, and partly because undeveloped state of its agriculture. Besides poor yields, the agrarian economy of the State also suffers from inadequacy of transport and lack of organised marketing facilities.

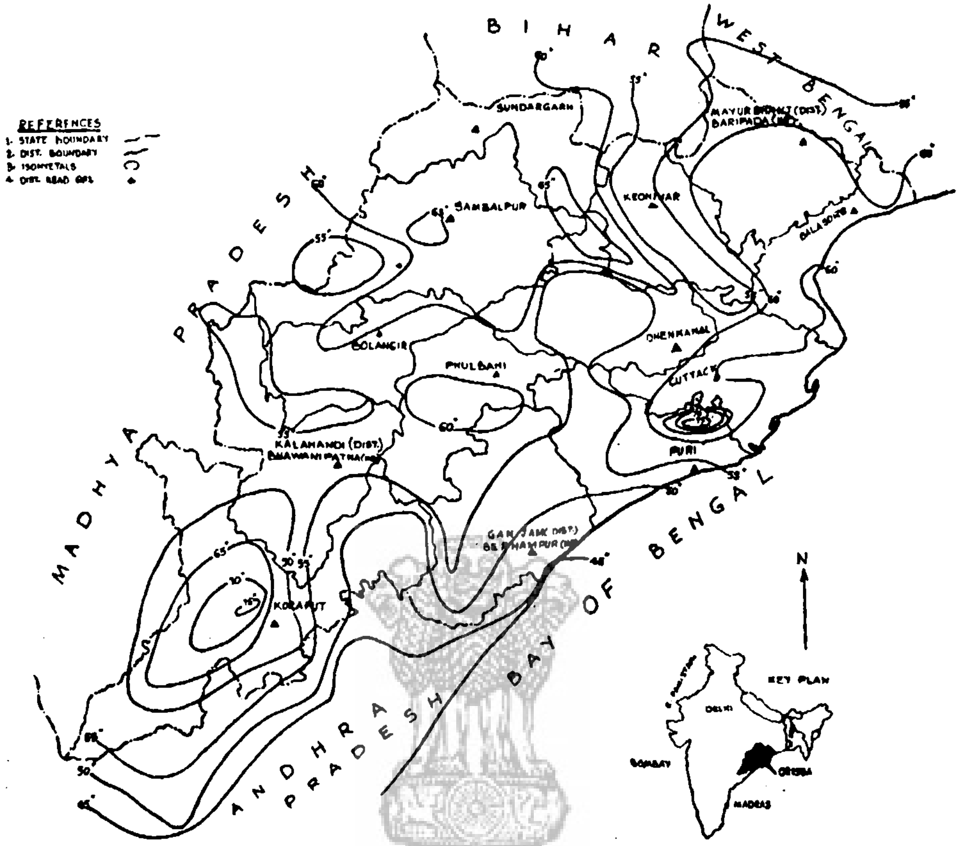

Fig. 1.2. *An Isohyetal map of Orissa State*

LAND UTILISATION STATISTICS

1.7. Geographical area and figures pertaining to irrigated and unirrigated agriculture in Orissa in the year 1958-59 are indicated below:—*

	(In thousand acres)
As per Surveyor General of India	38,504
As per Village Records	38,401
Forest	8,799
Area not available for cultivation	6,274
Other uncultivated land	6,466
Fallow	3,008
Net area sown	13,854
Total cropped area	14,958
Area sown more than once	1,104
Net area irrigated	2,414
Percentage of irrigated area to net area sown	17·4

**Source*—Land utilisation Statistics 1958-59 issued by the Directorate of Economics and Statistics, October, 1962.

1.8. The acreage and production of principal crops in 1960-61 in the State are given in Table 1.1:—

TABLE 1.1

Crop	Acreage ('000 acres)	Yield ('000 tons)	Yield per acre (lbs.)	All India average yield (lbs.)
1	2	3	4	5
Rice	9,335	3,668	879	909
Jowar	18	4	487	484
Bajra	11	1	203	252
Maize	55	9	367	822
Wheat	16	4	527	756
Small millets	114	14	275	360
Gram	50	5	224	600
Other pulses	1,175	239	447	332
Tur	35	7	447	777

Source—Final estimated figures 1960-61 issued by the Directorate of Economics & Statistics.

1.9. It would seem that if efforts are mobilised to increase the area under double cropping, it will, not only augment agricultural production from the lands, but may have a salutary effect on reducing seasonal unemployment in rural areas, which the State is faced with every now and then.

MINOR IRRIGATION PROGRAMME

1.10. With regard to minor irrigation works, the expenditure incurred by the State on different categories of works under First and Second Five Year Plans, and as now envisaged under Third Five Year Plan is shown in Table 1.2.

TABLE 1.2.

Plan Period	Allocation (rupees in *lakhs*)	Area expected to be benefited (acres in *lakhs*)
1	2	3
First Five Year Plan	270·04	2·00
Second Five Year Plan	149·71 from G.M.F. and 189·62 from C. D. Sector	
	339·33	1·60
Third Five Year Plan	300·04 Agriculture Sector	1·20
	C.D. Sector	1·50

1.11. The Minor Irrigation programme, revised due to declaration of National Emergency, envisages to bring about an additional area of 50 per cent of the target of the Third Plan, under the Agriculture Sector. Thus the Third Plan target stands as 1.80 *lakh* acres under the Agriculture Sector, and 1.50 *lakh* acres under Community Development Sector, totalling to 3.30 *lakh* acres. Under the programme of Agriculture Sector 0.60 *lakh* acres area has been included under Lift Irrigation.

1.12. 74,000 acres potential under Minor Irrigation, is stated to have been created in the *first two years of the Third Plan*. Year-wise programme for achievement of the Third Plan Period balance of 3.25 *lakh* acres has been formulated as given below:—

	Acres
1963-64	75,000
1964-65	1,50,000
1965-66	1,02,000
Total	3,27,000

1.13. To appraise the actual achievement of the First and Second Plan periods, survey of the Minor Irrigation Works is being done in the newly created Rural Engineering Organisation. On 80 projects so far appraised it is observed, that against the recorded ayacut of 40,800 acres, actual ayacut is 31,342, which is 23.2 per cent less.

1.14. Generally, however, it seems that overall land and water resources of the State are not being utilised adequately. In fact, the population intensity is low in some areas, where vast resources of land-water exist. A concerted effort for colonising those areas may seem necessary. Under colonisation plans it would seem desirable to bring in representatives from agriculturally developed tracts like Ganjam district in the State itself and the adjoining districts of Andhra Pradesh. If people from agriculturally developed areas migrate into these regions on a permanent basis, it may be possible to tone up agricultural economy of the State.

CHAPTER II

Small Diversion Schemes

2.1. The general topographical features of the terrain in Orissa afford many sites where small diversion weirs could be put up and water led through small canals to irrigate areas sometimes running into thousands of acres. Rainfall pattern is such that perennial supplies cannot be expected over most of these diversion weirs. They, therefore, mostly feed seasonal canals primarily intended to supplement rainfall and thus save paddy crops from failure on account of occasional droughts, though they are not very frequent. In these streams there is hardly any water left after the rainy season and these diversion weirs therefore fail to serve any purpose in the cold weather. In this respect they are just like *kharif bandharas* in western States of Gujarat and Maharashtra which provide supplemental irrigation to paddy crops.

2.2. The diversion weirs in Orissa State can be classified into two distinct heads, *viz*:—

(i) those built in the pre-Plan period; and

(ii) those built during the Plan periods.

The State authorities are unable to provide as at present any data to indicate the total census of such diversion weirs, though attempt is now being made to compile such information. The Team had occasion to visit a number of diversion weirs (Figure 2.1) and field observations thereabout with regard to their state of repairs, technical capabilities and performance are given in the following paragraphs.

Kuradhi Diversion Weir

2.3. Construction of Kuradhi diversion weir on Kuradhi *nala* a perennial tributary of river Brahmni, located at a distance of about 12 miles from Lahunipada, near Bimalgarh Railway Station, was taken up in the year 1954-55 as a special Minor Irrigation Project at an estimated cost of Rs. 9.5 *lakhs*, out of the special grant made by the Government of India. In August 1959, this was revised to an estimate for Rs. 19.00 *lakhs* and eventual cost as now reported is going to be Rs. 52.74 *lakhs*.

2.4. The project started functioning and supplied water in the head reach area of the command for about a month in July 1959, when on 3rd August that year the main canal breached at 2 M/IF due to heavy downpour of rain.

2.5. Another major mishap happened on 15th August, 1960 when due to continuous heavy rains Kuradhi *nala* carried an unprecedent flood and 13.5 ft. water flowed over the weir crest leaving hardly 3 ft. free board on both sides of the flank walls of the structure. Water overtopped the banks causing 56 ft. long breach on left side and 200 ft. long on right side. The right side breach scoured and exposed

—REFERENCE—

S.NO.	NAME OF WORKS	DIST.	S.NO.	NAME OF WORKS	DIST.
1	KURDHI	SUNDARGARH	10	JAYMANGAL	PURI
2	SANMACHKANDHANNA	KEONJHAR	11	BHAINSA	BOLANGIR
3	PATRABHAGHA	DHENKANAL	12	LAKSHMIJHORE	BOLANGIR
4	SUSAB	DHENKANAL	13	PANDARIJHORE	BOLANGIR
5	THELKDKALI	DHENKANAL	14	NAIKENJHORE	BOLANGIR
6	SURESWARI	DHENKANAL	15	SUINI	KALAHANDI
7	MATALIA	DHENKANAL	16	CHANPIKOTE	KORAPUT
8	KHANDIMASKA	PHULBANI	17	VAKRADA	GANJAM
9	HADA	PURI	18	BYJALGADDA	GANJAM

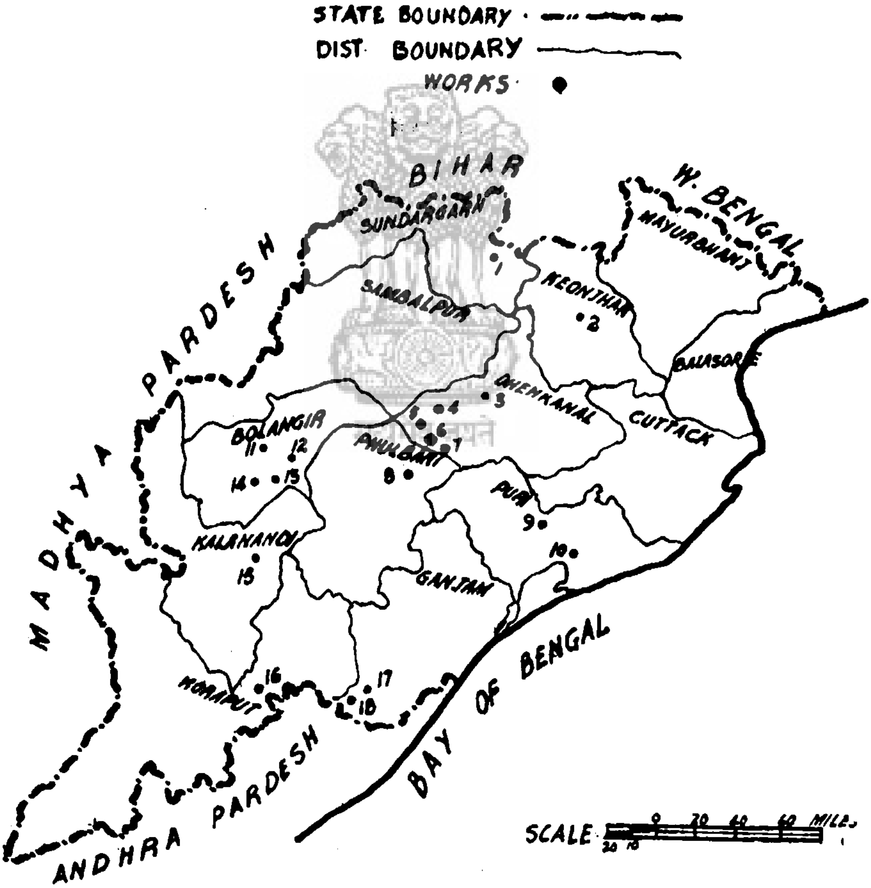

Fig. 2.1. *Location of Diversion weirs visited by the team.*

the foundations of the wing wall and water on the left side passed direct into the canal resulting in heavy damage to it throughout. The crest shutters of the weir were disconnected and thrown up at a considerable distance. In due course, a Flood Damage Repair estimate for Rs. 59,000 was prepared and necessary repair work was done.

2.6. By letting in some supply in the canal about 500 acres *Dalua* paddy is stated to have been irrigated in 1963 while in 1964, the project irrigated 1,500 acres *Dalua* paddy.

2.7. To bring the project to proper functioning condition two improvement estimates for the 1st and 2nd reaches have been sanctioned for Rs. 1,37,300 and Rs. 12,34,000 respectively.

2.8. The improvement in progress mainly includes provision of concrete apron and ogee type crest for the weir, improvements to existing cross drainage works on the canals and distributaries, provision of new drainage works wherever necessary, and extension of the canal system by about 5½ miles. Total cost of the project inclusive of expenditure on remodelling would be about Rs. 52.74 *lakhs*. The cost per acre would thus rise and will be Rs. 652 per acre.

2.9. Since the project is located on a perennial stream with a catchment of 108 sq. miles, carrying maximum discharge of 40,000 cusecs and minimum 30 cs., it has wide potentiality both in *kharif* and *rabi*. It is expected to irrigate 8,100 acres in *kharif* and 4,800 acres in *rabi*.

2.10. The off-taking canal is, however, a contour channel. All the drainage have been let into the canal. Besides, the railway line recently built for the Hindustan Steel Ltd. in close proximity of the project, is also interfering with the drainage. As it is, considerable work is required to be done before it can be put into operation and maintenance becomes easy.

2.11. The project, originally taken up by the Revenue Department of the State, appears to have been approved and executed without adequate technical scrutiny. With 14½ miles length of distributaries, commanded ayacut was envisaged as 9,000 acres. Whereas, as per survey conducted by the Rural Engineering Organisation, the project will irrigate 8,100 acres ayacut after extension of the canal system by another 5½ miles. Best use has now to be made of Rs. 19 *lakhs* already spent on the project. The project initially to cost Rs. 9.5 *lakhs* will require total expenditure of Rs. 52.74 *lakhs*, many times of its original estimated cost. Had the project been scrutinized technically at appropriate levels in the first instance, the cost to provide irrigation in this ayacut may have been much less and better alignments of the canal system may have resulted.

2.12. It is also to be seen how far artificial irrigation supplements the annual precipitation of about 60″. Paddy is the main *kharif* crop of the area. Unless the cropping pattern is radically changed in favour of irrigated crops in *kharif* and big drive is made to make the cultivators *rabi* conscious, the project constructed at such a heavy cost, may remain unproductive both for the State and the cultivators.

2.13. Construction of field channels is very essential to have planned *rabi*. In *kharif* also, irrigation through well aligned watercourses yield better results as water application is equitable, over flooding of the crop in the head reaches, which is the usual outcome of field to field irrigation is avoided and the unwholesome process of washing away of manures to the field down below checked. Thus to have the best results, timely attention needs to be given to land levelling, outletting, and laying of well aligned water courses. When it is envisaged to bring about 4,800 acres area under *rabi* and the minimum discharge available in the stream is 30 cusecs, most economical use of water has to be made.

2.14. Paddy—paddy and green manure could be suitable crop rotation in this area. Paddy could also be followed by groundnut which being good paying crop has its leguminous value also to restore fertility of the soil. Wheat could also be grown with advantage after paddy.

2.15. The newly laid railway line of the Hindustan Steel Limited along the command of this project is a good transport link with Rourkela. Cultivation of vegetables could be developed on Kuradhi project with an assured market at Rourkela which has a population of over one *lakh.*

2.16. This area could also become a good basis for horticultural operations and with the marketing facilities available at Rourkela, gardening is confidently recommended.

Sanmachkandhanna diversion weir

2.17. Located about five miles west of Keonjhar the Team visited Sanmachkandhanna diversion weir built across the stream called by the same name.

2.18. The stream has a catchment of 18 sq. miles, situated in an annual average rainfall zone of 40 inches. It has a maximum discharge of 12,000 cusecs. During summer months the flow is to the extent of about 10 cusecs.

2.19. The project was constructed in 1955-56 by the Revenue Department at a cost of Rs. 1,12,000. Overall length of the existing diversion weir is 150 feet and height 3 feet. There are 2 Nos. scouring vents of 4 × 3 feet each provided with fall-board shutters. These are now stated to have been replaced by screw gear shutters.

2.20. It seems that with the technical know-how available to the Revenue Department, full potentialities of the perennial stream have not been adequately exploited. The project can give irrigation to about 2,000 acres area, whereas, presently it serves only about 800 acres.

2.21. The main canal takes off from the right side of the weir with an authorised discharge of 38 cusecs. The canal, after giving irrigation direct and through distributaries, tails into a tank called Rajbandha from which another canal takes off to irrigate about 100 acres ayacut. In some portions the alignment of the canal is *zig zag*, which is attributed to difficulties encountered in land acquisition. In the head reach it goes along the toe of the adjoining hills. Hill slopes are fairly steep. During rains the canal invariably gets chocked and flooded due to absence of proper cross drainage works. Boulders in the earth work of the canal make the banks liable to breach.

2.22. Due to imperfect functioning of the scouring sluices, bed of the stream above the weir is badly silted up, which needs to be attended to. Screw gear shutters since fixed may improve the situation.

2.23. The project has since been resurveyed by the Rural Engineering Organisation. Remodelling of the weir and the distribution system is expected to cost Rs. 2,46,000. After reconstruction, the project which now irrigates 900 acres is expected to give irrigation in 2,000 acres area in *kharif* and 500 acres in *rabi*.

2.24. As the stream is perennial, it is envisaged that double cropped area may be to the extent of 500 acres. Intensity of irrigation would be 125 per cent. Cost per acre including the expenditure already incurred would be Rs. 143.

2.25. Expenditure on remodelling would be more than four times of the initial expenditure incurred on it. To add to the utility of the project, the State authorities may see that properly aligned watercourses are also designed and executed.

2.26. It may be advisable to change the alignment of the canal and give direct irrigation to the lower portion of the ayacut, avoiding the Rajbandh tank in which the canal presently tails. The tank bed area which is about 50 acres, could well be reclaimed and brought under cultivation. A small tank for domestic and pisciculture use could be retained, if necessary.

Patrabhagha Diversion Weir

2.27. The weir constructed across the Patrabhagha *nala*, which is a tributary of the river Brahmni, is located at a distance of two miles west of Patrabhagha village in Sadar Sub-Division, district Dhenkanal.

2.28. It is stone masonry weir 110 feet long with two scouring sluices 5 x 9 ft. each and one head sluice 4 x 2 ft. It has been designed to pass flood water over the crest to the depth of 5 feet.

2.29. The scheme was sanctioned in the year 1954, in view of the acute drought conditions then prevailing. It is to serve about 800 acres of ayacut. The weir was completed during the year 1957-58 at a cost of Rs. 48,102 against the estimated cost of Rs. 48,504.

2.30. There has been further expenditure since. The overall expenditure estimated and made so far on the project, has been categorised as below:—

Estimated

1 Main project (1953-54)	48,504
2 Improvement Works (1957-58)	15,000
3 Special Repairs (1958-59)	6,900
Total ..	70,404

2.31. The actual expenditure of Rs. 14,119.20 had been incurred to the end of the year 1961-62 for item (2) above. This pertains to remodelling and extension of supply channel, fixing shutter gates to the scouring sluices and head sluices *etc*.

2.32. Similarly, a sum of Rs. 6,900 had been spent during the year 1960-61 for special repairs and desilting of the channel as under item (3).

2.33. The Team had occasion to see the above work in the month of May, 1963. By then no irrigation had started. Apparently there has been no use made of the facility for so many years. The canal constructed does not look like an irrigation channel. The entire reach is an embankment. The work has been done by various agencies in different reaches. At the time of the visit of the Team, the canal was lying breached at many places. During rains, it gets silted up quickly as drainage water from the adjoining catchment area enters into the canal in absence of proper drainage works.

2.34. It will seem advantageous to have a technical scrutiny made of the work so far completed and the scheme put in working shape as early as possible to serve the irrigational needs of the area catered for.*

Susab Irrigation Scheme

2.35. It is a diversion weir constructed across the Susab stream near village Susab, Kishorenagar Block in Dhenkanal district. The Susab stream is a perennial one. The average rainfall in the area is 55 inches (according to the rainfall records from 1954 to 1961). Supplies in the stream, however, run short after the month of February. The catchment area of the stream above the weir site is 7.5 square miles.

2.36. The scheme was constructed in the year 1951 at a cost of Rs. 14,390. The length of the weir is 98 ft. Its height is 4 ft. above the bed of the river. The crest level is at R.L. 389.00 and the maximum flood level at R.L. 394.00. The canal is designed to carry 9 cusecs discharge. Its length is about 4,000 ft. The section of the canal as actually observed is 3.5 feet bed width, and 1.55 feet full supply depth.

2.37. The gross command under the scheme is about 950 acres out of which 750 acres approximately is the culturable commanded area. 475 acres is the annual irrigable area. The principal crop being irrigated is paddy and there is no double crop area. The cost per acre (C.C.A.) is Rs. 19.

2.38. As observed, the canal was not being maintained properly. The beneficiaries take care of the maintenance of the canal and headworks *etc*. The water is regulated from the headworks as well as from the canal by the people themselves according to their demand.†

2.39. The section of the channel due to silt deposits was very irregular. It was varying in width at places. The banks of the canal were also uneven. There were no proper outlets fixed on the canal. There was neither any gauge nor any proper regulator.

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*Since reported detailed investigations have been taken up.

†The project has since been taken over by R.E.O. for maintenance.

2.40. There was, therefore, quite a large proportion of water being wasted by leakage through banks, by over watering to the fields and also by field to field irrigation.

2.41. It would, therefore seem advantageous if:—

(*i*) the supplies available are properly controlled and regulated,

(*ii*) the area of service is extended,

(*iii*) the canal is remodelled and provided with proper outlets, and

(*iv*) a suitable crop pattern is planned and propagated.

Thelkonali Diversion Weir

2.42. Close to the Sambalpur-Cuttack road, the Team visited Thelkonali diversion weir. The project was built in the year 1951. Against the estimated cost of Rs. 24,294 actual expenditure on it is stated to be Rs. 21,416.

2.43. Tabidi *nala* on which the weir is built is a perennial stream and has a catchment of 5.5 sq. miles at the weir site. Average annual rainfall is 55 inches. Right Bank Canal is 3,200 ft. in length and Left Bank canal 9,800 feet. These canals have an authorised discharge of 9 and 6 cusecs to serve an ayacut of 1,500 and 400 acres respectively*.

2.44. The Right Bank Canal tails below the road into another stream running alongside named Silluamba on which another masonry weir is built. Silluamba is semi perennial stream and the perennial supply link serves as a feeder to the canal taking off from it to provide assured irrigation.

2.45. The State Authorities, however, now propose to limit the Right Bank Canal to only 1,200 feet and make full use of water available from Tabidi *nala*.

2.46. For the area on the other side of Silluamba stream another diversion weir named Sara-ki-Pali can help irrigation of the lands that are now being irrigated by this project through rotation system.

Sureswari Minor Irrigation Project

2.47. Sureswari masonry diversion weir was also visited by the Team in the end of March 1962. It is located near village Dangapal in Kishorenagar Block of Dhenkanal district. The project was executed in 1940, during the Ex-Darbar Rule.

2.48. Sureswari *nala* at the weir site has a catchment of 9.5 sq. miles. Average annual rainfall is 55 inches. It is a perennial stream with a minimum flow of 3 cusecs. Benefits of irrigation can accrue to the beneficiaries all the year round. The weir is 86 feet in length, 2.25 feet in height and is provided with five servicing vents of three feet width.

2.49. The sluice for the right bank canal is 6 feet wide. The canal which is 6 miles in length is presently functioning as an inundation canal designed to carry approximately 10 cusecs discharge. Bed slope provided is roughly 1 in 3,000.

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*State Authorities now propose to limit the ayacut to 350 acres on the Right and 200 acres on the Left Bank Canals with discharges of 7 and 6 cusecs respectively.

2.50. Cost of the project, stated to have been ascertained from the Work Sarkar of the Darbar period, is Rs. 1,200 only. The command area is 1,200 acres, and annual irrigable area is 1,000 acres. Cost of the project thus roughly comes to a little over Re. one per acre. Apparently works during Darbar Administration may have been executed with voluntary labour contributed by the beneficiaries.

2.51. Though the weir is constructed at an insignificantly low cost and is of a old type, it is giving satisfactory irrigation.

2.52. The administration at present is not incurring any expenditure on this project as the distribution and maintenance is being done by the beneficiaries themselves.*

2.53. Cultivators are fairly enthusiastic to make use of the available supplies. Better results could, however, accrue with proper maintenance of the distribution system and remodelling of the existing weir as per P.W.D. standards as much as possible.

2.54. It is understood that a proposal to construct a new weir 320 feet downstream of the existing weir is afoot at an estimated cost of Rs. 1,50,000. This expenditure will seem justified only if the area catered for increases and there is better field management of supplies.

2.55. The possibility of creating a storage in the upper reaches of the stream needs to be investigated. The weir could be more useful with sustained and assured supply.

2.56. In small irrigation schemes which take off in hilly areas, it may seem advantageous to install Micro-Hydel Plants. Advantage of water fall, so taken provides much needed electricity in rural areas leading to Rural Electrification on a small scale.

Matalia Irrigation Project

2.57. This diversion irrigation project is constructed near village Purunagrah, in *tehsil* Angul, district Dhenkanal. The stream has a catchment area of 44 square miles with an average annual rainfall of 50 inches. Construction of the weir which is 16 feet in length was completed in the year 1950-51 at a cost of Rs. 2,94,000.

2.58. The ayacut as initially proposed on both left and right side canals was 4,050 acres. The stream although non-perennial one has a flow of about 5 cusecs till end of December and can provide *rabi* irrigation to about 300 acres.

2.59. At present 760 acres of area is being irrigated on the left canal against the original 2,300 acres proposed, as 1,800 acres of proposed ayacut is being submerged by the Darjang Medium Irrigation Project. In the right side only 100 acres are irrigated against 1,750 acres as the authorities of the Resettlement Colony have not reclaimed the forest so far. High priority should be given to the reclamation.

2.60. For improvement in the ayacut a provision of Rs. 1,25,950 has been made and ultimate ayacut after improvement would be 762 acres on the left and 309 acres on the right canal.

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*The Project has since been taken over by the R.E.O.

2.61. With 4,050 acres ayacut originally envisaged, cost per acre works out to Rs. 73/-. The effective cost per acre with actual irrigation of 860 acres on both the canals comes to Rs. 488/-. No material change has taken place in the cropping pattern. The only benefit is protection against drought.

2.62. The left and right canals, designed for 33 and 20 cusecs respectively are 2,350 and 6,800 feet long. The left canal starts irrigating land from its three outlets all at the tail of the canal. The canal water directly enters into the fields. This practice of irrigation is continuing since the construction of the scheme. It is not only wasteful but damages the fields nearer to the outlets. The available water could have been used more profitably and spread more uniformly on larger area had proper water-courses and field channels been built. Similar condition exists on the right canal.

2.63. The State Authorities are working out an estimate to provide proper outlets and field channels. The Orissa Irr. Act, 1961, however, places the responsibility of constructing the field channels on the beneficiaries only. Suitable amendments if necessary, to enforce this obligation, needs to be made.

2.64. Action has been taken in other States of the Union for expediting the construction of field channels. It will be advantageous if the State Authorities evolve a suitable system for this purpose as early as possible.

2.65. On both these canals outleting system needs to be rationalised. The reclamation work needs also be taken up with high priority, so that the irrigation supplies available are utilised to help greater production from the existing land and water resources.

2.66. No water rates, it was stated, have yet been imposed. Recently the management of the scheme has been taken over by the Rural Engineering Organisation. It is being proposed to levy compulsory water rate as per irrigation Rules of Orissa 1961.

Krandimaska Diversion Weir

2.67. Krandimaska weir is situated about 6 miles east of Phulbani on a small non-perennial stream. Its catchment area is hilly and is about one square mile. Average rainfall is about 55 inches.

2.68. The scheme was taken up by the Revenue Department in the year 1955-56. It was completed in the year 1960-61, at the cost of Rs. 37,850.

2.69. The proposed irrigation is 200 acres during *kharif* and 50 acres during *rabi*. When the Team visited the weir in November 1962, almost entire flow was passing over the weir. Hardly quarter of a cusec was finding its way into the channel, which was silted up. As such, no irrigation was possible.

2.70. The head reach of the channel, in about 200 yards length, has been constructed close at the foot of the hill. It has a steep slope. Rain water from top hills flows down into the channel and silts it up.

2.71. Cultivators too have not shown any interest in irrigation. Their lands are sufficiently away from the work. It is a small work, situated in the interior and does not receive due attention from departmental agencies too.*

Hada Diversion Weir

2.72. Visit was paid by the Team to Hada diversion weir located in village Sanakumari of Puri district. Its construction was taken in hand in 1951. The proposal was to construct a diversion weir across *Hada nadi* to irrigate 1,200 and 1,800 acres of land through right and left bank canals respectively. Since the ayacut for the right bank canal already had provision of irrigation from the existing Balagadia Irrigation Project close to Hada weir site, which was meeting, the demands of the people, the proposal for right bank canal was dropped.

2.73. The original estimate for the project was framed for Rs. 1,69,000. The headworks, canal reach No. 1 and 3 feet drop, were constructed at an approximate cost of Rs. 1,06,000. In the year 1956-57 further distribution works such as canal syphon over Tantuli *nala* and improvement of canal No. 2 were executed. The total expenditure incurred till then was Rs. 1,18,757.

2.74. The project was resurveyed to provide assured irrigation to 1,800 acres ayacut. It was found necessary to re-align and extend the left bank canal beyond Kandabindha tank, with some additions and alterations in the C.D. Works and to make up some damages caused by floods.

2.75. The original estimate of Rs. 1,69,000 was thus revised to Rs. 2,82,580. It is reproduced below:—

Serial No.	Sub-head of estimate	Original estimated amount	Revised estimated amount	Difference (+) or (+)	Remarks
1.	Head Works ..	1,43,000	1,33,460	(—) 9,540	
2.	Main canal, branches & distributaries ..	26,000	1,48,850	(+)1,22,850	
3.	Water courses ..	..	270	(+) 270	
	Total ..	1,69,000	2,82,580	1,23,120—9,540 = (+)1,13,580	

2.76. The canal length sanctioned up to R.D. 12,840 was done up to R.D. 5,800 only by the end of March 1962, when the Team visited the project. During the course of eleven years, the project is stated to have yielded 600 acres irrigation in *kharif* 1961. In the interest of early utilisation of the irrigation potential it is imperative that Minor Irrigation Works are sanctioned after thorough technical and hydrological investigations. This will obviate repeated surveys and revisions of estimates which otherwise go on mounting. In this case as already mentioned, the project was expected to cost Rs. 1,69,000 for providing irrigation to 3,000 acres on left and right bank canals, whereas, as per revised estimate, the cost to irrigate an ayacut of 1,750 acres has risen to Rs. 2,82,580. Cost per acre has thus gone up from Rs. 53 to Rs. 161. It is yet to be seen as to how much area out of 1,750 acres ayacut is actually irrigated and what the effective cost per acre comes to.

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*The work is stated to have since been taken over by the R.E.O. and shortcomings pointed out attended to.

2.77. Another important observation is in connection with the unauthorised use of water on Hada *nadi* upstream of the weir. During the slack supply period, when every drop of available water is needed to be utilised for *rabi* irrigation through the canal, the Team came across obstructions in the bed of the river at various places. Water was being lifted through '*tendas*'.

2.78. This issue needs serious consideration of the State Government. In the interest of ensuring irrigation supplies in the ayacuts of the projects on which huge expenditures are incurred, action is called for the removal of such blocades and interferences in the flow of water in the streams on which irrigation works are located, and such rights if any, extinguished. Such streams need to be notified well in time to nullify any previous riparian rights, and to cause punitive action for any subsequent infringements.

2.79. It was also seen that two *tendas* were fixed right into Hada canal in the headreach. Such interferences are not conducive to the development of healthy irrigation practices and attainment of the required regime of the channels.*

2.80. The Team had the occasion to interview Shri G.S. Patnaik, Chairman *Panchayat Samiti*, Bolagarh, and Shri Bishwanath Samantary, Secretary, *Adhoc* Congress Committee, Badgack Block. They represented that the people in the command of Hada canal system may be allowed to conserve water in the tanks for utilisation when required. Since the canal is not likely to perform perennial supply role, filling of suitable tanks which can retain water for use when supplies in the stream dwindle down may be looked into.†

2.81. It was also pointed out by the cultivators that ground water is met at 10 to 15 feet depth. It can be lifted manually through *tendas* for irrigation. The Government, it was stated, does not encourage and subsidise construction of wells for irrigation in the areas within the command of the canal. It was represented that, for trial sake, subsidy for construction of well and provision of diesel pumping set may be sanctioned. Since well irrigation is scarce in Orissa, it may be worthwhile exploring its possibilities by giving due encouragement to sink wells at places where geological observations reveal ample ground water supplies. In the canal commands, such wells can be used as supplementary source of irrigation.

2.82. Hada project is located in an annual rainfall zone of 42 inches. It has a catchment of 20.25 square miles. Out of a gross area of 1,750 acres, commanded area is stated to be 1,200 acres. The principal crop grown in the area is paddy. There is scope for development of irrigation on the project.

2.83. Layout of properly aligned water-courses will go a long way in helping early development.†

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*The team has been informed that unauthorised *Tendas* fixed in the canal have since been got removed.

†The State Authorities have informed that action is being taken to implement the suggestions.

Jaymangal Irrigation Scheme

2.84. It is an ogee type stone masonry weir, constructed on Jaymangal *nala*, running between Harikund Mandia and Solari hills in Banapur P.S., Puri district. The length at the top of the weir is 85 ft. It is provided with four scouring sluices and has afflux *bund*, on both sides. Length of the left afflux *bund* is 140 feet and that of right afflux *bund* 115 feet.

2.85. The catchment area above the weir is about 16.5 square miles. The average annual rainfall in the area is 42 inches. The weir has been designed to pass maximum flood discharge upto the depth of 5 feet over the crest. The nature of the soil is black cotton soil.

2.86. The scheme was sanctioned for Rs. 2,99,500. The weir portion with afflux *bunds* etc. was completed at an actual cost of Rs. 1,83,671 in the year 1957. This project is stated to have been initiated due to scarcity of rainfall in the area. Two canals, Solari and Baradhini with a discharge of 25.96 cusecs and 7.35 cusecs respectively have been designed to irrigate 1,550 acres of area. There has been no irrigation so far, as the canal system has not yet been completed.

2.87. The time lag of six years between the completion of the work and the channels is a matter of concern. This delay is stated to be due to difficulty in acquisition of land. In the month of November ample irrigational ferver was seen in the adjoining areas. Available supplies were being actively applied to paddy. In Jaymangal project area too, utilisation would have been equally enthusiastic as in the neighbourhood, had the canal system been completed along with the weir and supplies made available.*

2.88. The money and material put in the project thus remained unproductive for want of water distribution system. If the work had been expedited, losses could have been avoided.

Bhainsa Diversion Weir

2.89. Bhainsa Diversion Weir was seen by the Team in Bolangir district towards the end of March, 1962. The project was constructed in the year 1955-56 at a cost of Rs. 14,500. The stream has a catchment of 4 square miles and annual rainfall of the area is 55 inches. Length of the weir is 70 feet.

2.90. This project is without proper canal system. Irrigation is done field to field. Provision of Irrigation channels, outlets, and well aligned water courses, would go a long way to maximise utilisation of supplies.

2.91. The project is stated to have given 453 acres irrigation. Paddy is the main crop sown in the ayacut. Since the stream is non-perennial there is no *rabi* irrigation. There are quite a number of such projects in the State which are useful only for *kharif* irrigation. Since the catchment area and the area of service almost lie in the same rainfall zone, their utilisation in good monsoon years is not much.

2.92. Such *kharif* works appear to have been taken up only as safeguard against occasional droughts. The Team would suggest that investments on such type of works need be made with due caution.

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*To accelerate the process, creation of separate cells for land acquisition for the R.E.O is stated to be under the active consideration of the State Government.

Lakshmijhor Diversion Weir

2.93. Lakshmijhor diversion weir situated near Bolangir town was visited by the Team in March 1962. This project was constructed in the year 1954.

2.94. The original estimate was for Rs. 50,000. It was later revised to Rs. 78,000. Actual completion cost, however, is stated to have risen to Rs. 89,365.

2.95. There are two canals taking off from the weir. Left bank canal 1,348 ft. long has commanded ayacut of 200 acres. Right bank canal 9,309 ft. long, has a commanded ayacut of 400 acres. It is estimated that their actual performance is just 50 per cent, *viz.*, 100 acres and 200 acres respectively.

2.96. As per original estimate of Rs. 50,000 and area of service 600 acres, cost per acre was reckoned at Rs. 83 per acre. Effective cost of irrigating 300 acres against an expenditure of Rs. 89,365 comes to Rs. 298.*

2.97. It was observed that due to non provision of a cross drainage work close to the head of left bank canal a breach stated to have occurred during 1961 monsoons, was still lying unrepaired in March 1962. Considerable loss thus occurs both in the benefit of irrigation to the cultivators and revenues to the State.

2.98. Since the project is located close to Bolangir town, and irrigation is done also within the Municipal limits, there are vast possibilities of its development and becoming productive with proper coordinated efforts of the P.W.D., Revenue, and Agriculture Departments.

Pandarijore Diversion Weir

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2.99. Construction of Pandarijore minor irrigation project situated in village Dangarpara, district Bolangir was taken up in the year 1954-55. As per original estimate, cost of the project was Rs. 81,843. Till 1958, the main body wall, 1,300 and 500 feet embankments on the right and left banks respectively, and a portion of the canal could be completed at an expenditure of Rs. 76,126.

2.100. The estimate has since been revised and the total cost would come to Rs. 1,41,950. It is stated that there was no provision of 4 No. cross drainage works in the original estimate.

2.101. Catchment area of the scheme is 5.40 sq. miles. Average annual rainfall of the zone is 53 inches. The scheme is envisaged to give irrigation in 560 acres in *kharif* on the right and left canals. The right bank canal will be 2 miles in length carrying 12.5 cusecs discharge, and left bank canal will be 1,000 ft. long and the discharge will be 4 cusecs.

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*The State Authorities have since informed that with the improvement now proposed, the project will irrigate 650 acres in *Kharif*, 150 acres in *Rabi* and 32 acres of vegetables. Total cost of the project, inclusive of previous expenditure, would be Rs. 2·06 lakhs and the cost per acre would work out to Rs. 250.

2.102. As per original estimate when the project was sanctioned, cost per acre was Rs. 102 which has since risen to Rs. 254 as per revised estimate. Originally it was thought that the rock would stand the action of water and there would be no scour, but scouring has actually started which needs to be attended to.

2.103. Plastering provided in the estimate had not yet been done. Screwgear shutters too have yet to be installed.*

2.104. The work needs to be completed early so that benefit may begin to accrue therefrom as soon as possible.*

Naikenjore Diversion Weir

2.105. Naikenjore weir portion was taken up for construction in September 1954 and was completed in the course of three years. Cost of the project is stated to be Rs. 62,000. It is designed to irrigate 657 acres, in *kharif* and 143 acres in *rabi*. The project has a catchment of 7.60 square miles and the average annual rainfall of the zone is 53 inches. Length of the weir is 160 feet and height 15.75 ft. Height of the abutment main body wall is 8.50 feet. The weir is provided with 3 scouring sluices of 3 feet each.

2.106. It is stated that the canal could be constructed up to a length of 2,700 feet only. Due to land acquisition difficulties, it could not be taken further. The problem still remains unsolved. For want of complete water distribution system, the project is only irrigating about 350 acres. Actual irrigation performance figures are, however, not available.

2.107. Non availability of land for the canal which has come in the way of utilisation of irrigation supplies needs to be looked into. If the land acquisition procedure on the Statute is inadequate (as it appears to be), the State Govt. may consider to amend it so as to make its operation speedily effective or executive action may be caused to overcome the existing difficulties in land acquisition.

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Suini Diversion Weir

2.108. Suini diversion weir was visited by the Team towards the end of March, 1962. The project is located on Mater *nala* in Kuksara Block, district Kalahandi.

2.109. The weir was constructed by the Ex-State Kalahandi and the distribution system was taken up for execution in the year 1960-61. The estimated cost of the distribution system is Rs. 2,20,480. The project is expected to irrigate an area of 2,700 acres. Cost per acre comes to Rs. 82.

2.110. The project has a catchment of 15 square miles and is located in an average annual rainfall zone of 50 inches.

2.111. The distribution system consists of 1 mile long main canal with an authorised discharge of 58 cusecs at head, one branch canal of 2½ miles length and 3 distributaries measuring 11,220 feet., 12,210 feet and 13,922 ft. Gross area of the project is 3,212, out of which 2,700 acres would be commandable.

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*The State Authorities have informed that the work has since been completed.

2.112. The diversion weir constructed during Durbar administration is being provided with canal system. Irrigation had not commenced till the time of Team's visit.

2.113. Paddy is the main rain-fed crop grown in the ayacut in *kharif*. Propaganda is needed to create irrigation consciousness amongst the beneficiaries. The Agriculture Department should prescribe suitable irrigated crop pattern. To cut time lag to the minimum between the creation and utilisation of irrigation supplies it is essential to create pre-preparedness in this direction. With the commencement of irrigation, suitably located Demonstration plots in cultivators land may be set up within the command to convince them of the efficiency and economy of irrigation.

2.114. Along with the execution of the distribution system, suitably aligned water-courses need also to be constructed for optimum and economic utilisation of water.

Champikote Diversion Weir

2.115. Champikote minor irrigation project visited by the Team, is in Rayagada *Taluka* of Koraput district. The project was constructed in 1936 by the *ex-zamindari* Jeypore estate.

2.116. It is located on a hilly perennial stream called Bonamda *nala*, and has a catchment of 40 square miles. It was stated that even in the driest season, there is about 10 cusecs flow in the stream. The project has thus ample potentialities to provide irrigation in both *kharif* and *rabi*.

2.117. The weir is 81.5 feet long, 5 feet high, and has a top width of 3.25 feet. R.L. of the crest is 757.25 and that of top of the head regulator wall 763.56. Since there are no scouring sluices, there is silting up on up-stream side. There is no head regulator for the canal. It would seem advantageous if these are provided now.*

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2.118. 1,200 acres area in the command was being assessed to land rent plus water rates at the rate of Rs. 6 per acre annually in the Jeypore *Ex-Zamindari* period irrespective of the crops grown in the area. *Zamindari* system was abolished on December 29, 1952. The mode of charge has, however, remained the same, *viz.*, Rs. 6 per acre, on the same 1,200 acres ayacut.

2.119. Actual observations have revealed that a high level channel has been off taking up-stream of the weir right from *Zamindari* time. It is irrigating about 35 acres area, which is not included in the fixed ayacut of 1,200 acres. This 35 acres irrigation is escaping assessment.†

2.120. Similarly some water is being led to other areas outside the fixed ayacut and is not being charged for. It is necessary to undertake field to field survey of the irrigated area. Ayacut may be recast on rational basis and the fixed rate levied on the revised area to check leakage of revenue.†

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*The required head regulator and scouring sluices are since reported to have been provided.

†As per verified ayacut, the area actually receiving irrigation is now stated to have been communicated to the Revenue Deptt. for assessment of rent.

2.121. There is only one left bank canal taking off from the weir side. The main canal up to R. D. 2,300 feet goes at the foot of the hill close to the *nala*. Masonry wall in a length of about 2,000 feet has been constructed at the left bank of the canal to guard against choking.

2.122. The weir construction is of old type. The retaining wall is leaking at a number of places which need to be attended to. The weir is stated to have been raised by 1.5 feet in 1952. There is no gauge fixed in the canal or at the weir and thus no hydrological data thereof is maintained. Under the head "XVIII—ORE", sums of Rs. 11,100, 4,850 and 7,250 were spent in the years 1954-55, 1958-59 and 1961-62 respectively on repairs. The work may need remodelling to a more efficient design.

2.123. The terrain is such, that there are ample possibilities of extending irrigation in the areas out of the present fixed command of 1,200 acres. Recent survey is stated to have revealed that the gross command of the remodelled project could be 3,238 acres and culturable command 2,110 acres. To achieve it, renovations are expected to cost Rs. 1,90,000.

2.124. The cultivators are quite progressive. They can do double cropping. Lot of area is brought under virginia tobacco and number of barns have come up for curing of tobacco. One such barn owned by Shri Ratuala Bagwan of village Ganjam in the ayacut of Champikote project was seen by the Team. Cost of construction and equipments is about Rs. 4,000. Virginia tobacco produce of about 6 to 8 acres can be treated in one barn. Out of a total holding of 80 acres this cultivator had put in virginia tobacco in 8 acres area.

Vakrada Diversion Weir

2.125. The Team visited Vakrada diversion weir situated at a distance of about 1½ miles east of Vansdhara Railway station, Parlakhemundi Light Railway in Kashinagar Block, Ganjam district.

2.126. A crude type weir with stepped apron was stated to have been constructed on Vakrada stream about two decades back by the Maharaja of the erstwhile Parlakhemundi State. It was to irrigate about 50 acres area. For want of proper repairs and maintenance, condition of the weir deteriorated.

2.127. After integration of the princely State, the work was surveyed and an estimate amounting to Rs. 37,000 was framed for remodelling of the weir to make it more effective and widen the area of command.

2.128. The Collector, Ganjam district accorded sanction and the reconstruction work was taken in hand by the Revenue Department. An expenditure of about Rs. 14,000 had been incurred. It is gathered that a weir 425 feet was planned. It has been partly constructed. The stream width is hardly 50 feet. Major portion of the weir has been constructed on left side of the stream in cultivated fields.

2.129. The Rural Engineering Organisation in whose charge the work has since been placed, has after a preliminary survey stopped further construction of the project. Apparently the work was undertaken without competent technical scrutiny.

2.130. This may not be a solitary instance of sub-standard type of minor irrigation work, conceived, approved and executed. The Team feels, that, irrigation works, whatever may be their magnitude, need to be handled with proper technical competence, preferably by the Irrigation Department.

Byjalgadda Diversion Weir

2.131. Another problem project the Team came across was Byjalgadda diversion weir in Kashinagar Block. Approved at an estimated cost of Rs. 33,000, it was taken up for construction by the Revenue Department. An expenditure of about Rs. 7,000 is stated to have been incurred in the procurement of the material by the time the project came in the charge of Rural Engineering Organisation. On scrutiny, the project is stated to have been found technically unfeasible, and has consequently been abandoned. It will thus be seen that the project was taken up for execution without proper technical scrutiny.

2.132. Apart from any monetary loss involved, the amount of disappointment caused by the abandonment of the project to the cultivators, could have been avoided.

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CHAPTER III

Tanks and Reservoirs

3.1. In contrast to the deltaic region bordering the sea, the remaining parts of the State of Orissa have had no major irrigation schemes in the past. Hirakud Dam has come up only recently. The two sources of irrigation tapped on a moderate scale were diversion weirs dealt with in Chapter II and small tanks and reservoirs built from time to time in different districts, partly as a famine relief measure. In some of the princely States tanks and reservoirs were put up by the ruling chiefs to provide irrigation to their farms. There are some big works too, built in masonry.

3.2. The Team during their field inspections visited a number of tanks and reservoirs of different categories, of different ages and of different types (Fig. 3.1). Utilisation of the facilities provided, vary

S.No	NAME OF WORKS	DIST.	S.No.	NAME OF WORKS	DIST.
1.	DERAS	PURI	7	ASHASAGAR	KALAHANDI
2.	MATRAJHAR	PURI	8	BAKRATA	BOLANGIR
3.	NARAINSAGAR	GANJAM	9	KARLAKATA	BOLANGIR
4.	KRISHNA SAGAR	GANJAM	10	SITAGUNDRI	PHULBANI
5	BRINDABANSAGAR	GANJAM	11	PANCHMOHLA	DHENKANAL
6	BHATRAJHORE	KALAHANDI	12	RAJBANDH	MAYURBHANJ

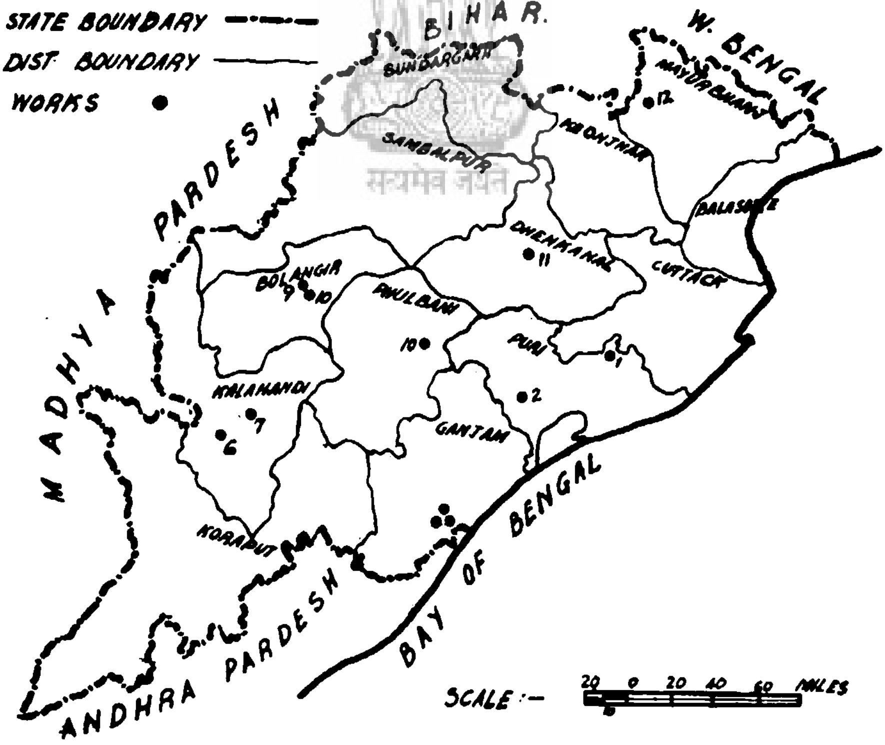

Fig. 3·1 Locations of tanks and Reservoirs visited by the Team.

from region to region. The works visited cover practically all the districts of the State and field observation there about are given in the paragraphs that follow.

Deras Irrigation Project

3.3 The Minor Irrigation Team during its visit to Orissa State in March 1962 had the occasion to visit Deras reservoir and Deras Farm in district Puri (Figure 3.2).

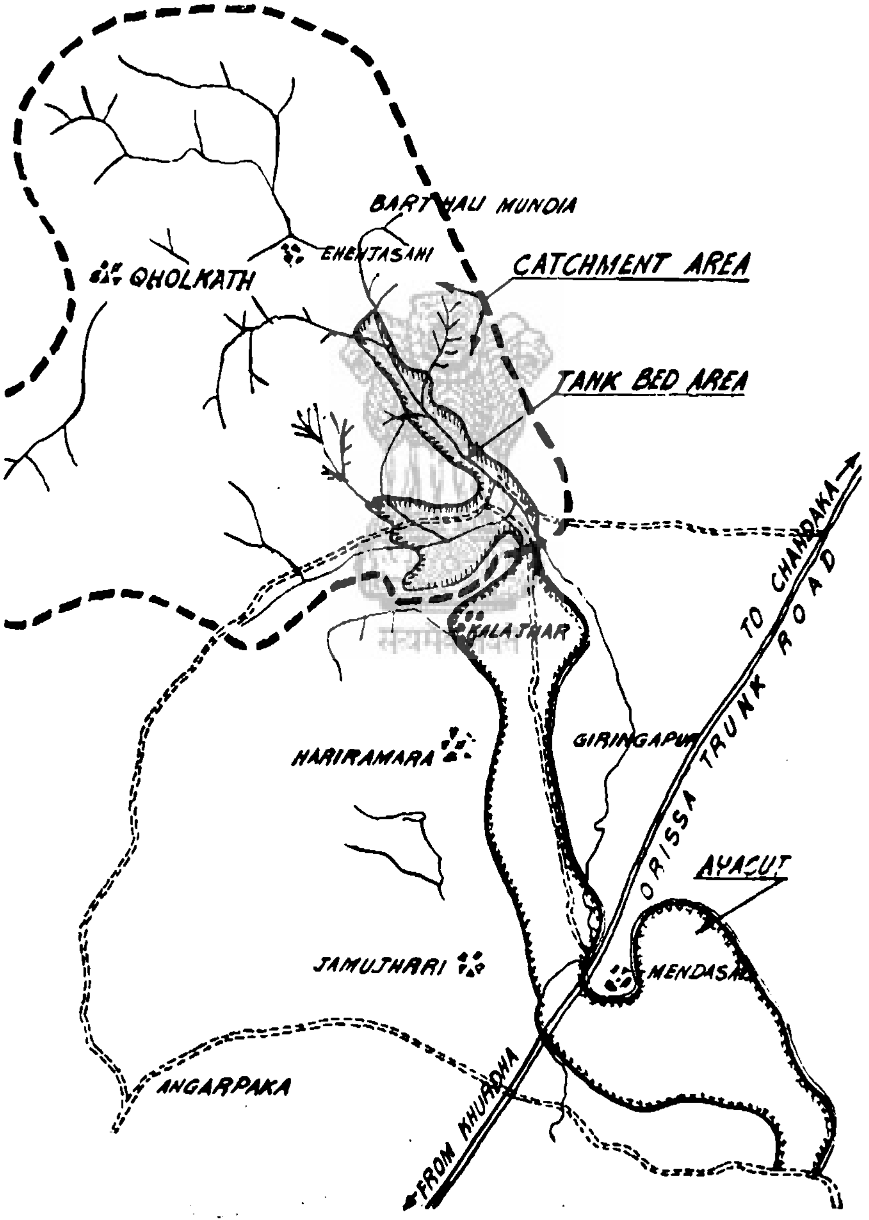

Fig. 3·2. Index map of Deras Irrigation Project.

3.4. Deras reservoir has a catchment of 12.33 sq. miles, and is located in the area having 53.49 inches average annual rainfall. Length at top of the dam is 1,500 ft. and the height is 54 ft. It is provided with 185 ft. long masonry waste weir, designed to pass maximum 4.64 ft. flood depth. The canal designed to carry 33 cusecs discharge will be 14,900 ft. in length. Gross storage capacity is 92 M.cft. Out of which 9.8 M. cft. is dead storage. Gross command of the project is 2,500 acres out of which 2,000 acres is the culturable commanded area. It is envisaged to give 2,000 acres irrigation during *kharif* and 800 acres in *rabi*. Total cost of the project is Rs. 13,99,934 and cost per acre of culturable commanded area comes to Rs. 700, which is higher than the conventional criteria fixed for reservoirs.

3.5. Construction of the project was taken in hand in 1947 and at the time of the visit of the Team it was still incomplete. This abnormal delay in the completion was attributed to seepage through the *bund*. To cope with the heavy seepage, puddle blanket was provided. There was still some percolation (about 1/10th cusec) seen below the spillway which may be controlled by extending the blanket. Boulders have not proved much effective to control scour. Wiregauge sausages are likely to prove more effective and may be tried. A bar has been provided about 500 ft. below the spillway.

3.6. The syphon required for the canal to cross the stream to irrigate the lower area of the command is yet to be constructed. So, for want of the crossing, irrigation is being provided in only about half of the commanded area. Instead of a syphon it may be advantageous to have a pick up weir at this site tailing the canal above the weir. In this way, the unavoidable seepage from the *bund* could be utilised besides obviating construction of a syphon.*

3.7. The abnormal time lag in the completion of the project has already affected adversely and to yield the desired results, it should be completed soon.

3.8. Ways and means to utilise the huge dead storage of 9.8 M. cft. need also to be looked into.

3.9. In the command of the project, General Seed Farm with an area of 200.49 acres was started in 1951 under the charge of the District Agricultural Officer, Puri. In the year 1956, a Jute Seed Farm of 300 acres under the Jute Development Officer, Orissa also came up. These two Farms have since been amalgamated and named Deras Farm.

3.10. Actual irrigation in Deras Farm in the year 1962-63 is stated to be 434 acres, (*kharif* 274 and *rabi* 160 acres). In the year 1963-64 the Farm authorities programmed to irrigate 334 acres in *kharif* and 269 acres in *rabi*.

3.11. Perusal of cropwise breakup of irrigated area in 1962-63 (reproduced on the next page) reveals that ample programme has been made to bring in the desired irrigated crop pattern.

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*It has been stated that the suggestion to have a pick up weir instead of a syphon has been approved.

Kharif

Crop	Area (acres)
Paddy	119·92
Jute for seed and fibre	63·40
Mesta for seed and fibre	21·77
Groundnut	9·28
Biri	20·81
Dhaincha for seed	4·02
Sasbania for seed	0·70
Til kharif	1·00
Maize	2·50
Kharif vegetables	1·61
Chillies	0·20
Cow pea	0·60
Orchard	8·14
Arhar	7·84
Ramie	0·04
Dhaincha for green manuring	4·12
Paddy seedling for flood	5·00
Potal	0·20
Arum	0·20
Sugarcane	3·30
Total	274·29

Rabi

Crop	Area (acres)
Rabi groundnut	20·44
Dalua Paddy	27·74
Wheat	15·50
Potato	5·25
Maize	2·42
Mung	31·29
Kulthi	15·30
Til	4·84
Cow pea	0·65
Cauliflower & Cabbage	3·30
Brinjal	1·85
Field Pea	2·96
Banana	0·93
Banana proposed	0·50
Pumpkin	2·25
Bitter gourd	0·40
Onion	0·04
Papaya	0·20
Water melon	0·70
Sugarcane	3·30
New Planting	4·10
Misc. vegetables	1·21
Tomato for seed	1·00
Orchard	8·14
Total	159·87

3.12. The results achieved at the Farm need to be published to convince the people of the benefits of irrigation, so that the irrigation potentials created are properly utilised. It would be advantageous to have such types of farms in the commands of other projects also wherever possible.

3.13. Financial aspect of the Deras Farm is as under:—

Receipts and Expenditure:—

1961-62	
Pay and allowances of Establishment	46,491·54
Contingencies (recurring)	56,964·94
Total expenditure	1,03,456·48
Receipts	51,750·60
1962-63	
Pay and allowances of the officers and Establishment	41,920·00
Contingencies (recurring)	81,920·00
Total Expenditure	1,23,840·00
(Anticipated) Receipts	83,394·00

3.14. It will be seen that the receipts in 1961-62 were about 50 per cent of the total expenditure and in 1962-63 they were anticipated to be about 67 per cent.

3.15. Since the Farms run by the Government are required to play their part in the field of demonstration, their economy should also be more convincing with favourable balance sheets. The receipts on Deras Farm during the two years under review more or less equate with the recurring contingencies. It is the expenditure on the establishment which tilts the balance. With proper check and control on the overhead charges, better farm practices, economic utilisation of water, healthier results could be achieved.

Katrajhari Project

3.16. The Team also visited Katrajhari minor irrigation project in Nayagarh Sub-Division, district Puri. A small *bund* is stated to have been constructed by the efforts of one Shri Jagrotra about 200 years ago, for storing water for domestic use. It later on developed into an irrigation tank. The ruler of the erstwhile Nayagarh Darbar took over the project and reconditioned it in the year 1932-33. With the merger of the State, the reservoir came to vest with the Government. It was in a dilapidated condition. Its renovation was considered and improvement works were actually taken up for execution in 1956, at a cost of Rs. 49,941.

3.17. Catchment area of the tank is two sq. miles. Average annual rainfall of the zone is 54 inches. It is an earthen dam with top length of 4,260 ft. and area under submergence 106 acres. Gross and live capacity is 44 and 20 M. cft. respectively. It is provided with a 40 ft. stepped apron type masonry waste weir, designed to pass 3 ft. maximum flood depth.

3.18. The project is not provided with canal system and irrigation is done field to field. Area in the command is 1,028.22 acres as per latest survey and the same has been taken as annual irrigable area.

3.19. The area under command since the Darbar administration was taken as 753 acres and assessment @ Re. 1/- per acre annually is being realised on it, although area actually receiving irrigation is stated to be 1,028.22 acres. Irrigation and assessment figures supplied by the State authorities from the year 1947-48 to 1960-61 are reproduced below:—

	1947-48	to	1956-57	1957-58	to	1960-61
	Kharif	*Rabi*	Total	*Kharif*	*Rabi*	Total
Irrigation (Acres)	753	753	1,506	1,028·22	—	1,028·22
Assessment (Rupees)	753	—	753	753	—	753

It will thus be seen that uniform irrigation figure of 753 acres in *kharif* and 753 acres in *rabi*, totalling to 1,506 acres annually from 1947-48 to 1956-57 have been repeated, and thereafter up to 1960-61 irrigation in *kharif* is shown as 1,028.22 acres, and in *rabi* nil. This is not understandable.

3.20. It can be presumed that the figures reported are not based on actual recording of irrigation. Since wet rate assessment @ Re. 1/- per acre is being levied on 753 acres, this figure has been repeated for *kharif* and also for *rabi* year after year up to 1956-57, and from 1957-58 onwards, only *kharif* irrigation of 1,028.22 acres has been posted although reassessment of the command as 1,028.22 acres is actually stated to have been done in the year 1962-63.

3.21. This fully establishes the presumption that actual recording of irrigation on minor irrigation works is not done. Without it, serviceability of the project and the utilisation of the potential created can not be adjudged. It is imperative to get actual irrigation booked irrespective of the fact whether assessment is fixed or fluctuating.

3.22. *Area Escaping Assessment*—Katrajhari project as per recent survey is irrigating 1,028.22 acres whereas assessment is being done on 753 acres. Thus 275.22 acres irrigated area is escaping assessment. Suitable action, legislative or executive, is needed to be caused immediately for regularisation of this and such other instances to check leakage of revenue.

3.23. There is no gauge fixed in the reservoir on any of the three sluices. Without proper gauge reading arrangements, correct account of water conserved, consumed, and left over, cannot be maintained. It is essential to fix gauges and have them read and recorded regularly on minor irrigation works also, as is done on major and medium projects.

3.24. Even in the command of such an old standing irrigation project, no irrigated follow-on crop in *Rabi* was seen. At the time of the visit in March 1962, irrigation in about 20 acres of stray sugarcane fields was being done. The cultivators are generally following the old unirrigated crop practices, broadcasting *moong* and other pulses here and there in the moisture of harvested paddy which do not usually require any subsequent waterings.

3.25. There was ample unutilised left over water standing in the reservoir after *kharif* paddy irrigation, which, with proper irrigated crop rotation, could have been put to use.

3.26 The Team had occasion to talk to some progressive cultivators of village Sarnakul. They stated that in absence of canals and watercourses, they were handicapped to utilise water during *rabi*. In *kharif* almost the entire commanded area is under paddy and usual practice of field to field irrigation serves the purpose, but in *rabi*, fields requiring irrigation are scattered for which provision of watercourses is essential.

3.27. The Rural Engineering Organisation, in whose charge the project has since been transferred from the Revenue Department, may align and construct suitable canals and outlets, and give watercourses alignment to the cultivators for execution.*

3.28. The cultivators present also asked to look into the feasibility of constructing a reservoir on Kusumnala and link it with Katrajhari project for the augmentation of supplies. The possibility may be examined.

3.29. It was told that the waste weir was lowered by 2 ft. in 1956. It may well be restored with proper strengthening of the bund. The area submerged would be same as prior to 1956 and thus there will be no question of any acquisition of land for the purpose. With proper layout of canals and watercourses, and the apparent zeal of the cultivators, better utilisation results of the conserved supplies, could be achieved.

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*The R.E.O. has since stated to have taken in hand the alignment and construction of water courses and fixation of outlets.

Narain Sagar

3.30. Narain Sagar located in Ganjam district is an old reservoir built and owned by *Zamindars*. With the abolition of the *Zamindari* system, the reservoir came to vest with the Revenue Department. Presently it has come in the charge of Rural Engineering Organisation, Berhampur.

3.31. Prior to the visit of the Team in November 1962, leakage in the earthen bund had occurred at about 600 feet from the lower level surplus weir. Necessary repairs were carried out. Plantains had been grown on the strengthened portion. Some seepage was, however, still visible. Instead of treating the *bund* at the outer slope, leakage could better have been located and controlled in a fool proof way by trenching and puddling the inner slope and provision of a blanket, if necessary.

3.32. Steep gradient of about 1 : 800 on the waste weir channel is causing erosion which is approaching towards the *bund* of the tank. Construction of proper falls at suitable intervals in the surplussing channel, canalisation, and pitching where necessary may solve the problem.

3.33. A lower level sluice is provided in the tank to deliver about 3 cusecs supply in the waste weir channel for irrigation of *rabi* and sugarcane crops of the head reach village Belupada. The sluice is made use of when water level in the tank falls below the lower level waste weir.

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3.34. About half a mile above Narain Sagar reservoir there is another tank called Krishna Sagar. Function of the latter is to act as silt trap. Actually the *bund* of Krishna Sagar had badly breached long ago and has not been repaired. The work as such is not serving its purpose. If, however, some afforestation and other measures to arrest silt movement could be taken in the catchment area, the silt trap could be done away with, and its 60 acres bed area reclaimed and brought under cultivation. The State authorities could look into it.

3.35. Keys of the sluices of Narain Sagar are stated to be with the Revenue Inspector. Recording of irrigation and assessment is done by the *Tehsildar.* Maintenance of the work is with the Rural Engineering Organisation. The system is not conducive to healthy performance of the projects and needs to be orientated on the lines followed in the Northern States of the country where maintenance, recording of irrigation, and assessment *etc.* are in the charge of the P.W.D. Irrigation Branch, and only collection of water rates is with the Revenue Department. The department which creates irrigation supplies can best look after their optimum utilisation and consequently its financial returns.*

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*The R.E.O. has since stated to have assumed full control of the project.

Krishna Sagar

3.36. In the month of November 1962 brisk agricultural activities were noticed by the Team in Parlakhemundi area, district Ganjam. Patches of sugarcane could be seen. Transplantation of chillies was in progress. Sweet potatoes and vegetables were also seen growing. The main paddy crop was in good condition and was being actively applied last watering, wherever necessary.

3.37. There are a number of perennial and semi-perennial streams in Parlakhemundi area of Ganjam district. The zeal to utilise water for irrigation is evident from the number of old tanks, diversion and pick-up weirs constructed in the ex-princely State.

3.38. Krishna Sagar an old irrigation reservoir was visited by the Team in the middle of November 1962. It is situated in village Kanhaipadar, *taluka* Parlakhemundi, district Ganjam.

3.39. As ascertained locally the project was built in the year 1890 by the Ruler of the erstwhile Parlakhemundi State. It is a well conceived scheme connecting two hills at the toe by an earthen bund of 1 mile 1 furlong in length and 18 ft. height. Full tank level of the reservoir is 10 ft. and M.T.L. 12 ft. above bed level.

3.40. The stream has a catchment of 27 sq. miles at the *bund* site. Average annual rainfall of the zone is approximately 48 inches. Water spread of the reservoir at the time of construction was 740 acres. The scheme was irrigating an area of 5,113.74 acres.

3.41. Due to lack of proper maintenance and repairs, and through passage of time the reservoir has silted up to the extent of about 4 ft. Area of serviceability of the project has shrunk from 5,113.74 acres to 4,000 acres. The result is that about 400 acres area of the tank bed has gone out of submergence effecting appreciable reduction in the capacity of the reservoir.

3.42. There is no annual M & R expenditure allotment for the scheme. Only one *khalasi* looks after the entire system. Condition of the *bund,* masonry structures such as sluices, surplus escapes, and pick-up weirs, has also deteriorated. The distribution system and watercourses are also in poor condition.*

3.43. The area of the tank bed, which has gone out of submergence, is stated to be under unauthorised occupation. It is being cultivated and some hamlets have also sprung up therein.

3.44. There are a large number of old irrigation tanks in Parlakhemundi and other adjoining areas. Due to accumulation of silt most of them have lost their storage capacity. The problem of unauthorised occupation of areas gone out of submergence, warrants immediate attention. Such areas after recovery from unauthorised occupation could be disposed off profitably, covering some part of the expenditure to be incurred on renovation of derelict tanks through an organised process of desilting-cum-reclamation.†

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*The R.E.O. has since stated to have taken up the maintenance and a proposal to improve the Project at a cost of Rs. 8,82,000 has been finalised.

†The R.E.O. is stated to have started working on the lines suggested.

3.45. There are two waste weirs provided on this project. One of these is just planks operated and the other is provided with automatic shutters. These shutters were not functioning at the time of Teams' visit. Appreciable leakage was occurring through the left waste weir. Also, at high level canal crossing at about R.D. 500 considerable leakage takes place. Action needs to be caused to stop such leakages.

3.46. The three bays of the aqueduct of 8 × 6 ft. each are incapable of passing full discharge from the 2.2 ft. long waste weir. Heading up and consequent overtopping occurs. The aqueduct with proper openings and well sectioned canal crossing needs to be rebuilt.

3.47. At the time of visit of the Team, left bank of the high level canal had breached about 100 ft. above the aqueduct. Water through the breach was running in the surplus channel. Although water in the surplus channel is picked up and used for irrigation through pick-up weirs lower down, it is necessary that breaches in the canal system are attended to promptly, repaired, and strengthened.

3.48. The Rural Engineering Organisation has since surveyed the project. Raising of *bund* by about 4 ft. is stated to be under active consideration. Feasibility of a judicious combination of desilting of tank bed and raising of *bund* may be considered to achieve partial restoration of the lost capacity of the reservoir, and also ensure safety of the earthen bund.

3.49. There is no levy of water charges for *kharif* irrigation. *Rabi* crops are stated to be assessed to water rates varying from Rs. 1.50 to Rs. 5 per acre according to the variety of crops. The team had asked for the actual irrigation and assessment figures of the project from 1947-48 to date which have, however, not been supplied.

3.50. The so called approach road to the reservoir was perilous, unsafe and at places not jeepable even. It required cross country effort to reach the destination at great personal risk. Conditions must be much more difficult during rains, when irrigation works need the attention of the supervisory staff the most. To facilitate their visits and inspections, it is necessary that safe and prompt transit facilities are provided. Construction of suitable service roads connecting irrigation works with main roads may be considered.*

Brindaban Sagar

3.51. Brindaban Sagar seen by the Team was once pulsating with life with live storage of water. It could now be identified only through the remanents of the dilapidated masonry structures. Its entire tank bed area is under cultivation.

3.52. There may be more works of the type of Brindaban Sagar which may have gone into oblivion or may have deteriorated to an extent of oblivity. Greater stress on maintenance of irrigation works, therefore, needs to be given and emphasis has to shift to proper maintenance and up keep from a programme of mere expansion of irrigation facilities in areas where their utilisation may prove problematic.

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*A provision of Rs. 15,000 for the approach road is since stated to have been made in the improvement estimate.

Krishna Chandra Sagar

3.53. Krishna Chandra Sagar reservoir, as per local enquiry, is stated to have been constructed in 1942-43 by the Maharaja of the erstwhile Parlakhemundi State, at a cost of Rs. 40,000. This project is located in Kashi Nagar Block of Parlakhemundi *Taluka*, district Ganjam.

3.54. It has a catchment of 3 sq. miles. Annual average rainfall is about 48 inches. 150 acres is the tank bed area. Gross area under the project is 400 acres and culturable commanded area 321.85 acres.

3.55. With the abolition of *Zamindari* system, the project came in the charge of Revenue Department. It later came to vest with Kashinagar. C.D. Block.

3.56. The tank, during the course of over twenty years, has silted up considerably. The emergent land appears to be under unauthorised occupation of the encroachees as at other silted up reservoirs in this area.

3.57. Irrigation figures from the year 1947-48 to 1961-62 are reported as 321.85 *kharif*, 20 acres *rabi*, annual total 341.85 acres. The same figures repeated year after year, indicate that they are only assumed, and strengthen the impression that recording of actual irrigation on minor irrigation works in Orissa State is not properly done.

3.58. Irrigation depends upon many a natural and human factors, and can seldom be a carbon copy. The reservoir too is in the process of silting and live capacity consequently on the decline has a direct bearing on the resultant irrigation.

Bhatrajore Reservoir

3.59. Bhatrajore minor irrigation project is situated in village Ranapur, *Taluka* Dharmagarh, district Kalahandi. It was constructed in 1955 at a cost of Rs. 6,19,650 out of the funds of the Ex-Community Project, Junagarh. Catchment area of the stream at the dam site is 36 sq. miles. Annual rainfall of the zone is about 60 inches.

3.60. Length of the earthen dam is 2,000 ft. The reservoir has a live capacity of 110 M.cft. and dead storage of 30 M.cft. Water spread is 450 acres. It is provided with 385 ft. long waste weir. Two canals take off from the dam. Right canal is 6½ miles in length and left canal 3 miles. 4,000 acres is the irrigable command of the project.

3.61. The ayacut has not yet been re-surveyed. Actual command can not, therefore, be specified. There is dual control on this small work. Head-works are under the P.W.D. (Irrigation) and the distribution system is in the charge of C.D. Department. Actual performance of the project could not be ascertained in spite of several references.*

3.62. So far no water rates are levied on this project, as on other minor irrigation projects in the State. Since water rates are not levied, it is presumed that no serious efforts are made to get actual irrigation recorded, or any physical check excercised by the supervisory staff in this respect. To have correct appraisal of the serviceability of the irrigation projects irrespective of whether water rates are levied or not, it is imperative that actual irrigation accruing therefrom is recorded.*

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*It is since stated that the Project has been taken over by the R.E.O. and action is being taken to implement the suggestions.

3.63. To ensure correct recording, it is also essential that minimum quotas of physical check of the same are assigned to the various cadres of the supervisory staff. Procedure to deal with any derelictions in booking of irrigation and its checking may be formulated as is the practice in Northern India States.*

3.64. 8,800 ft. long surplus channel was constructed to connect the waste weir with the stream. Surplussing arrangement did not work satisfactorily and heavy scouring started. The retrogression threatened the very existence of the waste weir. This necessitated redesigning of the waste weir. Chut type surplus weir was under construction when the Team visited the project towards the end of March 1962. To execute it, a revised estimate was framed for Rs. 13,35,560.

3.65. Such huge scouring should have been guarded against at the first instance with proper investigations and precautions. As it is, the project which was conceived and executed at a cost of Rs. 6,19,650, is being completed at more than double of the original estimate. The cost per acre on 4,000 acres assumed ayacut has consequently risen from Rs. 155 to Rs. 344 per acre.

3.66. Left bank canal takes off at the extreme left end of the dam beyond the surplus weir. A leading channel in the bed of the reservoir would be required to keep the left canal fed. This leading channel would get silted up. Extra expenditure shall have to be borne to keep it silt cleared. Lining may be helpful to some extent.

3.67. It is stated that about 100 acres area of the tank bed comes out of the submergence, which could profitably be leased out by the Government for *rabi* cultivation.†

3.68. Irrigation in the ayacut is done field to field. Layout of well aligned water-courses is required. Some of the shutters of the outlets were stated to have been stolen. Fool proof locking gate outlets may solve the problem.†

3.69. Catchment of 36 sq. miles may be capable of giving irrigation to about 7,000 acres. Extension of the present assumed command of 4,000 acres is possible and actually some area beyond the assumed ayacut is stated to be receiving irrigation. Resurvey of the ayacut may be conducted early to recast the same on realistic basis. When the demand for water develops, even utilisation of the dead storage of 30 M. cft. through lift could also be examined.

3.70. Since there are ample assured supplies available in the reservoir, there are good possibilities of development of *rabi* irrigation. The Agriculture Department may evolve a suitable cropping pattern to utilise conserved supplies all the year round.

3.71. It was seen that two '*Tendas*' were fixed direct in the right canal at about 500 ft. below the head sluice. Water was being lifted and fields of vegetables and sugarcane cultivated by Shri Gada Dhar Dhani Bisi of village Ranapur were being irrigated. Similar practice was noticed at some other minor irrigation works also. This is not an wholesome practice for developing irrigation. Direct irrigation from canals can eventually lead to unauthorised irrigation and interference to the normal running of the canal.‡

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* It is since stated that the projects have been taken over by the R.E.O. and action is being taken to implement the suggestions.

† It has since been stated that the suggestions are being attended to by the R.E.O.

‡ Unauthorised *Tendas* fixed in the canal are stated to have since been removed.

Ashasagar

3.72. Ashasagar reservior is both a domestic and irrigation project constructed by 'Kalahandi Darbar near Bhawani-patna. It was stated to be under the disputed control of the Town Municipal Committee and the district Administration.

3.73. Ashasagar irrigates Arkabali Seed Farm. Live storage of the reservoir is 11.50 M. cft. Sill level of the sluice is kept at R.L. 99.00 and F.T.L. at R.L. 104.00.

3.74. Levelling of the Seed Farm was in progress, when the Team visited the site towards the end of March 1962. Bulldozers were at work. In the Farm area a tank was being constructed for storage of water and utilisation through lift when required. Authorities incharge of the work had been requested and several times reminded to supply to the Team a plan of the Seed Farm showing spot levels, the canal and water courses, monthly gauges of the reservoir, *etc. etc.*, of which details have not been received.

3.75. However, from visual observation it could be seen that with the completion of the land levelling process, the entire area of the Seed Farm would be irrigable by flow from the Ashasagar reservoir. The Team feels that the expenditure on the tank, its maintenance, and recurring lifting expenses may not be factually justified.

3.76. If water level in the reservoir falls below the sill level of the canal sluice, lifting apparatus could very well be installed on the reservoir itself for utilisation in the Farm area. The tank constructed by the Farm management has its limitations of capacity and retention of water in comparison to the reservoir. Its very conception and construction appears questionable.

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Barakata Reservoir

3.77. Barakata reservoir situated in Bolangir district serves both domestic and irrigation purposes.

3.78. The rock foundation of the surplus weir yielded to the pressure and heavy scouring and retrogression occurred. This necessitated construction of a new waste weir at the same site at a cost of about Rs. 15,000 in 1959.

3.79. Natural surroundings are such that the dam could with advantage be extended towards the left side impounding more water. Land acquisition difficulties are stated to have stood in the way of acquiring more area for submergence, limiting storage of water and area of serviceability.

Karlakata Reservoir

3.80. It was end of March 1962, when the Team visited Karlakata reservoir in Patnagarh Sub-Division of Bolangir district. The project was constructed in 1954-55 at a cost of Rs. 55,953. The stream at the *bund* site has a catchment of 2.6 sq. miles situated in an average annual rainfall zone of about 53 inches. Length of the bund is 2,020 ft. and 30.38 acres is the area submerged.

3.81. The original scheme envisaged irrigation to be catered for an ayacut of 1,520 acres. This seems to be an unrealistic estimate of irrigation potentiality which could accrue from a catchment of 2.6 sq. miles. On resurvey the scheme is stated to be capable of providing irrigation to 525 acres in *kharif* and 100 acres in *rabi*. At present, however, irrigation is being done only in 200 acres area.

3.82. There is no regular canal. Irrigation is being done field to field. With the execution of canal system and field channels, levelling, and other developmental activities, it may be possible to extend area of irrigation. Command from the project is also possible in the area on the other side of the road. Since this area is not included in the original ayacut, it has to rank second in precedence.

3.83. After *kharif* paddy, there is ample water left over in the reservoir. Cultivators are not *rabi* minded. No efforts seem to have been mobilised to make use of that water. At the time of the visit of the Team, irrigation was being applied to about 30 acres sugarcane cultivated in the ayacut. Without proper channels it is difficult and wasteful to irrigate stray fields scattered in the ayacut. Field channels needs must be provided.

3.84. Direct from the reservoir on the right embankment an enthusiastic cultivator was seen lifting water by means of *'tenda'* and applying to his sugarcane field. Such direct off-take of water from the reservoir should not be encouraged. It is not conducive to the safety of the embankment itself.

3.85. The practice of having profiles (Namunas) on building earthwork embankments leads to satisfactory construction. It will be desirable if an item of profile building ahead of embankment construction is specified and insisted upon by State authorities for all such works.

3.86. Ample leakage was seen passing through the central sluice. To preserve the available supplies and achieve optimum utilisation thereof, the sluice need to be provided with satisfactory and fool proof closing device.

3.87. About 10 per cent of paddy cultivation in the ayacut is stated to be done through transplantation and rest is broadcasted. *Dhaincha* green manuring is also done in some area. With proper efforts, the Agriculture Department could propagate extension of such progressive activities.

3.88. Fishing lease is stated to be yielding Rs. 300 to Rs. 400 revenue yearly to the State Exchequer. Furtherence of pisciculture activities may prove more productive and bring more lease money to the Government.

Sitagudri Irrigation Tank

3.89. This is a small irrigation tank, located just at the foot of the hillocks on a seasonal stream with a water spread of 10.3 acres, in village Sitagudri, district Phulbeni. Its catchment is hilly and is about 1.12 sq. miles in area. It is not easily approachable during rainy season. This was constructed by the Revenue Department in the year 1960-61, at a cost of Rs. 36,000.

3.90. There were no technical details of the work available with the officials. The irrigation figures also could not be had from the records, which they had with them.

3.91. In November 1962, when the Team had occasion to see the work, there was very little storage in the tank, about 2 to 3 feet in depth with a water spread of about one acre only. The R.L. at waste weir or its F.S.L. was hardly 3 to 4 feet above the existing water surface level in the tank. The length of the spillway is almost the same as that of the main dam. It is actually more a diversion work than a tank for having a small holding capacity.

3.92. Most of the water which comes from the catchment, passes over the spillway. Whatever little quantity flows through the canal has not been utilised properly because the main channel and all other small works *etc.* were in damaged condition and were lying un-attended.

3.93. The canal taking off from the headwork is of the capacity of 5 to 6 cusec. It is heavily in digging in its head reach to the depth of 15 feet for about a quarter of a mile length. There were no gauges fixed on the headwork. The sluice gate was completely open. Water was passing through the gate and was almost standing in the canal as well as in the tank. There was hardly any flow.

3.94. The canal banks were in damaged condition. At some places the channel was lying blocked up by earth clods slipped down from the top banks. The ayacut as proposed is located about 1½ miles away from the tank. As soon as the canal comes out of the ridge, it runs along the left side of the road with number of culverts and temporary crossings on the road to deliver water to the fields all situated on the other side of the road. With the provision of one crossing in the beginning the channel could well be placed on the right side of the road on which the command lies to avoid unnecessary crossings.

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Panchmohla Storage Tank

3.95. The Team visited Panchmohla storage project in Angul Block, district Dhenkanal. Construction of the project was taken up by the Angul Block Agency in 1955-56 at an estimated cost of Rs. 15,000. The cost was later revised to Rs. 18,000. Actual cost of construction went up to Rs. 26,457. The scheme has a paltry catchment of one sq. mile and is expected to give irrigation to 120 acres.

3.96. A breach occurred in the *bund* in 1958 monsoons, which in March 1962 was still lying unrepaired. The site was giving an impression of an abandoned project. Expenditure of over Rs. 26,000 incurred on the project in 1956 has borne no fruit in the course of eight years. This is a matter of great concern.

3.97. The hydrological potentiality of the meagre catchment needs to be studied. If the scheme is technically sound, the State authorities may take necessary steps to repair the *bund*, execute distribution system, and put the project to use.

Rajbandh Reservoir

3.98. Quarter of a mile from Karanjia, district Mayur Bhanj, the Team saw Rajbandh tank. The stream on which the project is built has a catchment of 1.25 sq. miles at the dam site. Left bank canal is 200 ft. and right bank canal is 1.25 miles in length. Assumed ayacut on both the canals is 100 acres.

3.99. The land is so placed that more area could be commanded from storage provided by the catchment of 1.25 sq. miles. If investigations are done well, commands could be fixed up more realistically.

3.100. There are no watercourses provided on this project. Irrigation is done field to field. No gauge could be seen fixed at the reservoir or in the canals. There are open outlets at canal heads which are operated by planks. These need to be replaced by proper outlets.

3.101. The reservoir is used for pisciculture also. The *Gram Panchayat* is stated to lease it out for fishing and realise about Rs. 1,000 annually from it.

3.102. No water rates are levied so far. The project was stated to be in the charge of P.W.D. previously. It has since come in the jurisdiction of the Rural Engineering Organisation.

3.103. Of the many tanks visited by the Team in the State those located in southern part do have a tradition with regard to their upkeep and utilisation. Newly built tanks have mostly come up during the post-Independence period and seem to have been built in a haste without sufficient scrutiny with regard to the hydrology of the streams on which they are located and in some cases with regard to foundation conditions where they have been built. As a result, many storage schemes have come up which do not have a promise of fulfilling the targets set for them. In a number of cases the off taking channels from the storages have not yet been completed. In a few cases channels taking off are not in a condition to deliver water for one reason or the other Outleting has generally not been done and field to field irrigation is practised leading to wastage of water because field channels have not been built. All these shortcomings need a concerted effort which it is hoped the State authorities will mobilise through the aègis of Rural Engineering Organisation, which has come up now.

3.104. A good proportion of tanks have got silted up and it would be advantageous if the State organises a De-silting-*cum* Reclamation Programme as has been suggested earlier. Thus making the schemes pay back the cost through leasing out of reclaimed lands on the tanks periphery.

3.105. On some of the projects unrealistic and inflated commands have been fixed. This will be clear from *Appendix* IV where 80 projects surveyed by the Rural Engineering Organisation show that actual ayacut on them is 23.2 per cent less than their assumed ayacut.

CHAPTER IV

State Tubewells

4.1. Although coastal districts of Orissa fall in heavy rainfall zone, the State Government has entered the realms of tubewell irrigation in Balasore, Cuttack, Ganjam, and Puri districts. Total number of State tubewells inclusive of filter points *etc.* sunk so far is stated to be 100. District-wise break up is as under:—

District	*No. of tubewells*
Puri	15
Cuttack	23
Balasore	26
Ganjam	36
Total ...	100

4.2. Out of these 100 units, the Exploratory Tubewells Organisation of the Government of India are stated to have sunk 21 tubewells. Directorate of Lift Irrigation has done 16 deep tubewells and 63 filter points.

The Team could collect some operational data with respect to 21 tubewells of Balasore and Cuttack districts locations of which are given in Fig. 4.1. The tubewells visited by the Team are discussed in the following paragraphs:—

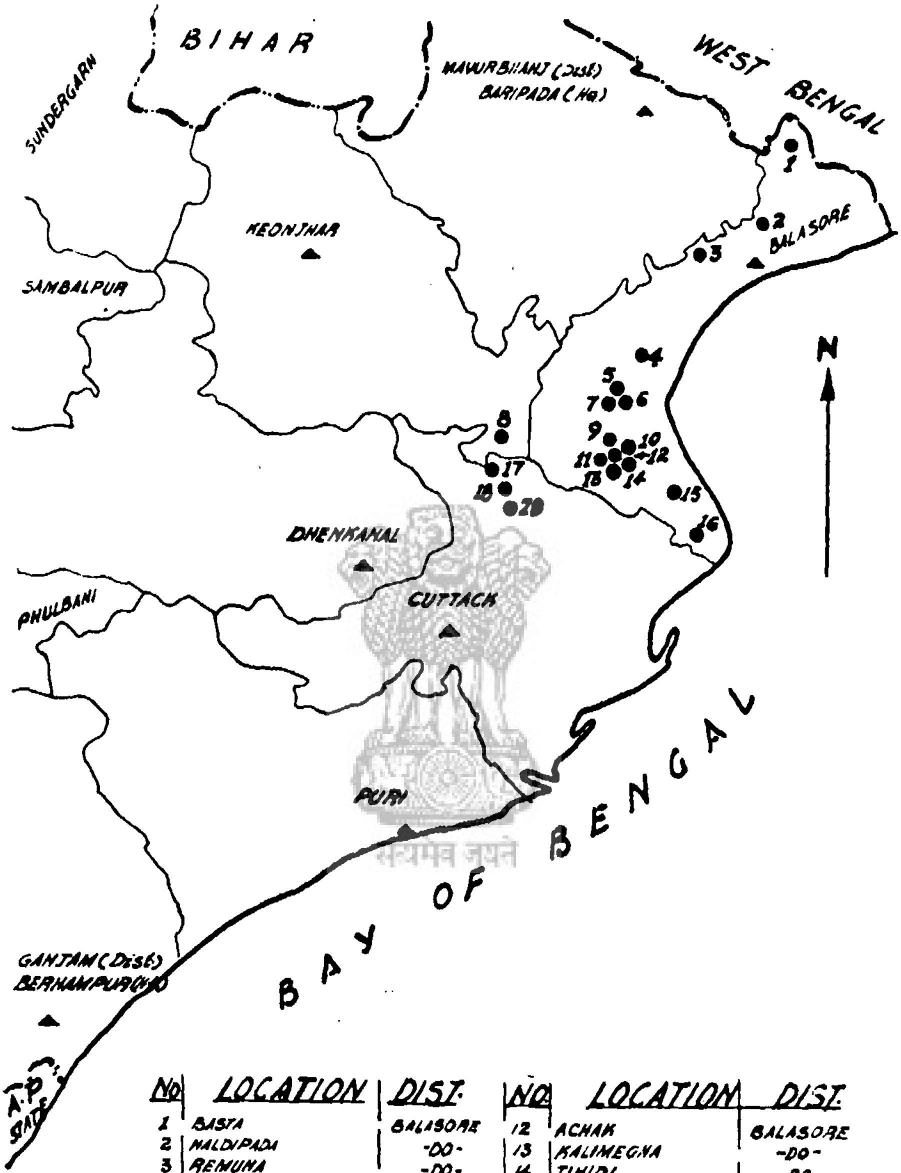
Haldipada Tubewell

4.3. Situated at 9th mile north of Balasore on the right side of Madras—Calcutta highway, Haldipada tubewell was installed in 1958. It is fitted with Oliver Super 21.5 H. P. diesel engine of American manufacture. Discharge of the tubewell is 31,800 gallons per hour. Boring was done to a depth of 447 ft.

4.4. There is no apparent demand for water. The record at site showed that the tubewell had functioned for the first time in *kharif* 1961 only for 6 hours. From September 1961 to end of March 1962 when the Team visited the site, it had run for a total of 50 hours in *rabi.*

4.5. This poor functioning of the scheme reflects upon the absence of enthusiasm on the part of cultivators and lack of pre-preparedness created amongst them by the concerned departments to utilise the costly supplies.

4.6. Approximately 250 acres area has been taken in command of Haldipada tubewell. *Rabi* 1961-62 cultivation had been done in about 15 acres area adjoining the pump house. To guard against the stray cattle menace, cultivators were maintaining one watchman. Village *Panchayat* was also stated to be making efforts to persuade people not to let loose their cattle. If their efforts succeed, more cultivators may take impetus to go in for follow-on irrigated crops after *kharif* paddy. All out persuasive and even punitive measures are needed to be taken in this respect to safeguard the crops and to achieve maximum use of the investments on tubewells.



No	LOCATION	DIST.	NO	LOCATION	DIST.
1	BASTA	BALASORE	12	ACHAK	BALASORE
2	HALDIPADA	-DO-	13	KALIMEGNA	-DO-
3	REMUNA	-DO-	14	TIHIDI	-DO-
4	SORO	-DO-	15	NALGUNDA	-DO-
5	MARKONA	-DO-	16	CHANDBALI	-DO-
6	SIMULIA	-DO-	17	PALASA	CUTTACK
7	MAITAPUR	-DO-	18	PANIKOILI	-DO-
8	AGARPADA	-DO-	19	ASURALI	-DO-
9	BUDANG	BALASORE	20	BADAGOVINDAPUR	-DO-
10	HALADHAR BINDHA	-DO-	21	RAUTRA BHED	-DO-
11	NANDAPUR	-DO-			

Figure 4·1 : *Showing the locations of large diameter Tube-wells in Orissa.*

4.7. Establishment at the Pump House consists of a Driver @ Rs. 45+Rs. 29 (pay and allowances respectively and a watchman @ Rs. 45 per mensum. Both of them are required to stay at the pumping station.

4.8. No watercourse scheme had so far been evolved. It was stated that in the header length R.C.C. pipe line was to be laid.

4.9. Civil works on State tubewells are in the charge of Assistant Agricultural Engineer, Civil, Tubewells, Bhubneshwar, while the mechanical aspect is looked after by the Assistant Agricultural Engineer, Mechanical, Tubewells, Balasore. Such sort of dual control at times results in lack of co-ordination and abnormal delays, which prove suicidal particularly at the time of keen demand. The State authorities may consider some sort of unified control on such irrigation units.*

Basta Tubewell

4.10. Basta tubewell in Balasore area was seen next by the Team. Constructed by the Exploratory Tubewell Organisation in 1958, the tubewell had not started functioning till end of March 1962 when the Team visited. It was seen that even the delivery pipe had not been fitted to it. The reason was attributed to lack of demand.

4.11. It is thus a matter for concern. No use had been made of the facility provided even up to four years from the construction of the tubewell. Even if the required preliminaries to assess the demand were not gone into before taking up the scheme, efforts should have been made afterwards to create conditions for utilisation of the potential created.

Remuna Tubewell

4.12. Remuna tubewell is another typical instance of lack of co-ordination. This tubewell was installed by the Exploratory Tubewell Organisation in 1958 and is fitted with electric motor.

4.13. The tubewell has not started functioning even six years after its installation as the Electricity Department has not been able to lay the power line up to it so far. The inordinate delay in energisation has caused loss to the Government on the locked up capital. If it was not possible for the Electricity Department to supply power for such a long time, feasibility of alternative arrangement of diesel pumping could have been considered and such an abnormal time lag on utilisation avoided.

Panikoili Tubewell

4.14. Panikoili tubewell was also drilled and completed by the Exploratory Tubewell Organisation in 1958. Construction of the pump chamber and drivers' quarters has been done by the Agriculture (Engineering) Department and also the over ground R.C.C. pipe line resting on pillars. Leading details of the unit are given below:—

(*i*) Power	15·5 H. P.
(*ii*) Discharge	20,400 gallons per hr.
(*iii*) Depth of tubewell	434·75 ft.
(*iv*) Ayacut	200 acres
(*v*) Total No. of cultivators of the ayacut area	59

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* **Both Civil and Mechanical Works of State tubewells have since been entrusted to one Assistant Engineer, posted at Balasore.**

4.15. Development of irrigation is also stated to have been held up on this tubewell on account of late energisation. Irrigation commenced on it only in *rabi* 1962-63. The cultivators felt that the soil being too poor, no other crop except paddy can be grown in this area. To give them impetus, the cultivators were supplied with seeds and fertilisers on loan. The Block staff gave them the necessary guidance and advice.

Following crops were grown:—

	Acres
Dalua	6·00
Mung	18·00
Groundnut	5·50
Maize	3·50
Rabi	3·50
Vegetables	2·58
Cotton	0·12
Total ..	39·20

4.16. The Government also took up departmentally cultivation of maize, *dalua*, and groundnut in the tubewell ayacut for demonstration and to infuse confidence amongst the cultivators. *Mung*, vegetables and cotton did not succeed.

4.17. Wide propaganda was made through the *Panchayat* to ward off stray cattle from the tubewell area. A guard was also engaged to watch the crops. In spite of these efforts, the reactionary elements amongst the local people are stated to have collectively let their cattle loose on the night of 20th April, 1963 and got the entire standing crop in the tubewell ayacut grazed.

4.18. The crops actually irrigated could have at best resulted in a revenue of about Rs. 700/- @ lift irrigation rates, which is only a small fraction of the working expenses incurred on running the tubewell. Actually no water charges have so far been imposed. As it is, the crops raised like *Mung* are reckoned as poor type of crops for tubewell irrigation. Better crops need to be planned in tubewell ayacut.

4.19. Co-operative Society of the beneficiaries has since been formed. With much persuation 46 cultivators out of 59 in the ayacut had paid their entry fee @ Re. 1. Only 18 had till then paid first instalment of share money of Rs. 10 per acre.

4.20. Estimated cost break-up of Panikoili tubewell is as under:—

	Rs.
1 Cost of tubewell with the electric motor and pump *etc.*	30,000
2 Cost of pump chamber and drivers' quarter including electrification ..	10,000
3 Cost of laying RCC pipes to an extent of 3,000 ft., including intermittent tanks @ Rs. 6·00 per ft.	10,000
Total ..	50,000

TABLE 4.1

Serial No.	Location	Year of construction	T.W. operation date	Area irrigated (acres)	Running hours	No. of units or diesel: Diesel (lits)	No. of units or diesel: Electric (Units)	Water rates levied	Remarks
1	2	3	4	5	6	7	8	9	10
				For year 1961-62					
1	Basta	1958	5-1-63	..	..	..	..	So far no water rates levied.	Pump was not installed.
2	Haldipada	1958	4-5-61	50	179·50	368	..		Pump is not installed & there is no electric connection.
3	Soro	1958	..	..	..	..	..		
4	Remuna	1958	..	..	..	..			These T.Ws. were inst. before 1959
5	Markona	1955	1956	6·10	38·40	200	..		
6	Simulia	1955	1956	1·30	9·45	50			
7	Maitapur	1955	1956						
8	Budang	1957	1957	8·58	94	380			
9	Haldhar bindha ..	1957	1957						
10	Nandapur	1958	1958	4·32	50	250			
11	Achak	1960	1960	5·73	38·45	150			
12	Kalimegha	1957	1957	1·50	28·15	150			
13	Tihidi	1958	1958	..	..	..	..		The pump is not used due to saline water.
14	Nalgunda	1958	..	..	..	..	..		Pump is not installed.
15	Chandbali	1958	..	..	..	..	..		
16	Agarpada	1958	..	13·13	64·00	325	..		Electric line is under construction.
17	Palsa	1958	..	..	..	..	..		
18	Panikoili	1958	5-8-62	Chamber was not constructed.					
19	Asurali	1962	..	..	..	..	..		Pump not installed.
20	Badagovindapur ..	1959	..	..	..	..	..		
21	Rautrabheda	1962	..	..	..	..	..		

No. tube wells functioned during the year	..	8
Total running hours during the year ..	..	502
Average Running hours per tube well ..	..	63
Total area Irrigated during the year ..	..	91 acres
Average area Irrigated per tube well ..	..	11 acres

For year 1962-63

1	2	3	4	5	6	7	8	9	10
1	Basta	1958	5-1-63	70	86·30	368		So far no water rates levied.	
2	Haldipada	1958	4-5-61	50	179·50	900			
3	Soro	1958	..	..	..	..	..		Pump not fitted.
4	Remuna	1958	..	..	..	..	..		Electricity is not available.
5	Markona	1955	1956	..	..	..	..		The progress reports are with D.A.O. Balasore.
6	Simulia	1955	1956						
7	Maitapur	1955	1956						
8	Budang	1957	1957	15	28	120	..		The progress reports are with D.A.O. upto Oct., 62.
9	Haldhar bindha	1957	1957	5	12	60	..		
10	Nandapur	1958	1958	15	65	325	..		The progress report from Oct. 62 have been received by this office.
11	Achak	1960	1960	30	69	330	..		
12	Kalimegha	1957	1957	17	75	365	..		
13	Tihidi	1958	1958	..	..	..	..		Saline water. Pump not used.
14	Nalgunda	1958	..	..	..	..	..		Pump is not installed.
15	Chandbali	1958	..	..	..	..	..		
16	Agarpada	1958	..	6	287·30	1435			
17	Palsa	1958	..						
18	Panikoili	1958	5-8-62	29·20	321·00	..	3,363 (Units)		
19	Ausrali	1962	..	..	..	..	..		Pump not yet installed.
20	Badagovindapur	1959	..	..	..	..	..		
21	Rautrabheda	1962	..	..	..	..	..		

No. tube wells functioned during the year	9
Total running hours during the year	1123
Average running hours per tube well	125
Total area Irrigated during the year	237 acres
Average area Irrigated per tube well	26 acres

To serve an ayacut of 200 acres cost per acre comes to Rs. 500, which the shareholders will have to bear. The success of the formation and functioning of the Co-operative Society would depend upon the productive and financial performance of the project. As the land in the ayacut is stated to be poor, big effort may have to be put in by the concerned departments, particularly the Agriculture Department, to demonstrate and propagate proper cropping pattern, technique of manuring, quantum of water application and its frequency *etc.* to achieve the best productivity results. The society after registration would take over the management of the tubewell.

4.21. The Team feels that the provision of costly over ground RCC pipe line constructed on pillars in the header length, when almost the entire ayacut is to be served through *kacha* water courses, is unnecessary. This could be replaced by equally serviceable open lined channel or underground hand spun concrete pipe line as the case may be, thus appreciably reducing the cost.

Performance of Tubewells

4.22. Performance picture of the 21 State Tubewells during the years 1961-62 and 1962-63 is given in Table 4.1.

4.23. It would thus be seen that out of 21 tubewells, some of them constructed in 1955, only 11 are reported to have functioned till 1962-63. Eight tubewells which functioned in 1961-62 yielded total irrigation of 90.66 acres, giving an average of about 11 acres per tubewell. Similarly nine tubewells which functioned in 1962-63 did an average of about 26 acres irrigation per tubewell.

4.24. Tubewell named Markona and Simulia were constructed in 1955. Irrigation on them in 1961-62 was 6.10 and 1.30 acres respectively. In 1962-63 no irrigation is reported on either of them. Tubewell named Maitapur installed also in 1955 had not done any irrigation upto 1962-63.

4.25. On six tubewells namely Soro, Nalgunda, Chandbali, Ausrali, Badagovindapur and Rautra-bheda, first three constructed in 1958 and Badagovindapur in 1959, even pumps have not yet been installed. Salinity of sub-soil water is stated to be the cause of non-utilisation of Tihidi tubewell. It would therefore, seem necessary to cause a check up on the deep tubewells, particularly in coastal or near coastal areas.

4.26. The performance picture of the State tubewells in Balasore and Cuttack districts is thus quite poor. With this record of performance, it may not seem justifiable to go ahead with the expansion programme. Specific rules and regulations for the operations of State tubewells need to be introduced.

Bayalishmouza Irrigation Scheme

4.27. The Directorate of Lift Irrigation, Orissa has embarked upon another broad based programme of utilisation of sub-soil water resources. Venue for it is 6,000 acres area of Bayalishmouza in Sadar Block, situated between rivers Kathjuri and Serna, in Cuttack district. Lying in between the two rivers, there is ample collection of water in dips and depressions in this island.

4.28. The cultivators, were using it for irrigation through '*tendas*' indigenous manual operated lift device and were raising cash crops like chillies, sugarcane, *saru*, potatoes and other vegetables. Use of water in this way was however, limited.

4.29. The Government of Orissa, on the representations of the cultivators, examined the possibilities of setting up mechanical lifts in order to make adequate use of the ground water resources.

4.30. Surveys were conducted. Lift irrigation scheme was formulated and approved by the Government in the year 1961-62 at an estimated cost of about Rs. 4.5 *lakhs*. Accordingly, two production tubewells were installed at Bentkar and Kalapara. These tubewells were found capable of yielding 1.5 cusecs sustained discharge with a modest draw down of 10 to 15 feet. Encouraged with the trial schemes, four more productive tubewells were installed in *Gram Panchayat* areas of Dhadibamanpur, Bentkar and Kulasarishnan.

4.31. Technical data of the six tubewells under reference is given in Table 4.2.

TABLE 4.2

Sl. No.	Name of the Plan	Stationary water level below ground level (ft.)	Draw down (ft.)	Height of flood water (ft.)	Pumping level (ft.)	Discharge per hour (gallons)	Boring depth (ft.)
1	2	3	4	5	6	7	8
1	Bentkar	19	15	1·2	34	32,000	180
2	Kalapara	14	6·5	7·5	20·5	33,000	146
3	Behalpara	18	14	2	32	47,000	250
4	Kadampara	14	12	1	26	30,000	250
5	Berhampur	18	12	..	34	30,000	268
6	Jharkata	14	12	..	26	Under test	160

4.32. It has been observed that sufficient subsoil water can be tapped within 250 ft. of the ground level. Each tubewell can provide irrigation to 150 to 200 acres of ayacut. Power lines have been drawn to the island and pump chambers of all these tubewells have been completed. Electric turbine pumping sets had been installed at three stations where power lines had gone up to pumping stations. At Kakpura, which is the extreme end of the island, a diesel engine had been provided as the power line had not reached that place.

4.33. Cost break-up of tubewells in Bayalishmouza is given below:—

	Rs.
1. Cost of Tubewell (6″ × 12″) including the cost of materials such as pipes, strainers installed to a depth of 250′ from the ground level @ Rs. 34	8,500
2. Cost of turbine pump having capacity of 34,000 gallons per hour against a total head of 50′ with motor and electrical accessories	7,000
3. Cost of pump chamber having suitable arrangement for lowering and lifting columns assembly of turbine pumps	3,000
4. Cost of internal wiring and electrical installations	750
5. Cost of laying out of 3,000 ft. R.C.C. pipes (9″—1000′ & 6″—2,000′) including cost @ Rs. 5·75 nP. per Rft.	17,250
6. Cost of Transportation	1,000
	37,500

A. Area to be irrigated—150 acres.

B. Capital investment per acre—$\frac{37,500}{150} = 250$

4.34. Costliest item is the provision of 3,000 ft. R.C.C. pipe line involving an expenditure of Rs. 17,250. Suitable cheaper alternatives of either lined open channels or hand spun concrete pipe lines mentioned earlier in the chapter may be considered.

4.35. For these six pumping schemes, Co-operative Societies are stated to have been formed and registered. The Directorate of Lift Irrigation, Orissa, has decided to provide irrigation to the entire island. More tubewells are contemplated to be installed on the formation of Co-operative Societies. Since the cultivators are keen to utilise pumped supplies, there are good prospects of development of irrigation in this island.

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4.36. The island of Bayalishmouza is not connected with Cuttack by bridge. Great difficulty was being experienced in transporting heavy tubewell and power installation material to the island by trucks through the dry bed of the river. The trucks had to struggle through sand at first gear. Running of vehicles could be made easier by spreading '*Sarkanda*' or preferably iron mesh of suitable thickness on the track. This is done to pass satisfactorily heavy traffic through sandy river beds.

Wells

4.37. Exploration of possibilities to have surface wells for irrigation have, by and large, not been done in Orissa. Well is a poor man's Minor Irrigation Project and cost of its sinking and working is well within a cultivators means with some State help, if necessary. Efforts needs to be mobilised to have surveys conducted, and wherever feasible, surface wells installed to augment agricultural production.

4.38. Contribution of wells to the total irrigated area of the various States in the Indian Union for the year 1958-59 is given in Table 4.3.

TABLE 4.3

(Area in 000 acres)

State	Total (net) irrigated area (all sources)	Area irrigated by wells.	Percentage of area irrigated by wells to total irrigated area
1	2	3	4
Andhra Pradesh	7,046	728	10·32
Assam (Excld. NEFA)	1,533	..	..
Bihar	5,090	681	13·37
Maharashtra (Incld. Gujarat) ..	3,807	2,484	65·24
Jammu & Kashmir	736	7	0·95
Kerala	870	35	3·98
Madhya Pradesh	2,072	741	35·76
Madras	5,586	1,346	24·09
Mysore	1,922	304	15·81
Orissa	2,414	94	3·89
Punjab	7,361	2,322	31·54
Rajasthan	3,571	1,944	54·43
Uttar Pradesh	12,138	5,754	47·44
West Bengal	3,339	39	1·16
Delhi	79	42	53·16
Himachal Pradesh	96	(*a*)	Nil
Manipur	149	..	..
Tripura	8	..	..
Andaman & Nicobar Islands ..	..	..	..
Laccadive, Minicoy & Amindive Islands	..	..	..
Total ..	57,825	16,521	28·57

(*a*) Less than 500 acres

Source—Directorate of Economics and Statistics, Ministry of Food and Agriculture, Govt. of India—October 1962.

4.39. It will be seen that against 28.57 per cent for the Indian Union, irrigation through wells with respect to total irrigation in Orissa State is only 3.89 per cent.

4.40. Irrigation wells may be problematic in deltaic areas due to presence of salinity below about 30 ft. or so, and so also in rocky soils where subsoil water is uncertain. Besides these, there are vast areas in the State where well irrigation could be possible, as in Bolangir district.

4.41 In fact, the Team had occasion to see a privately owned farm at Khurda where well irrigation was done. Area of the farm is about 16 acres. There is a well laid out orchard having variety of fruit trees such as Mangoes, Citrus, Gua, Cashewnuts, Papaya, Chico, Pineapple, *etc. etc*. Source of irrigation are two wells, one fitted with windmill water lifting arrangement, and the other with a fuel engine. Lined channels are built for irrigation. Though this farm lay in a neglected condition at the time of Team's visit—yet it shows the possibility of utilisation of wells for increasing agricultural production in the State.

4.42. The Team suggests that surveys of the areas where well irrigation could succeed may be organised to add to the contribution of wells towards the irrigated agriculture in the State.

CHAPTER V

Lift Irrigation

5.1. Lift Irrigation from streams, natural ponds and *kucha* open wells through indigenous appliances like *Tendas* etc. is practised in Orissa—more particularly in Ganjam district and coastal areas. This enables some cultivators to raise more than two crops in a year.

5.2. In recent years the State has initiated action in the field of lift irrigation through electric-diesel pumps. Some lift irrigation schemes were visited by the Team. They are dealt with in following paragraphs.

Rushikulya Lift Irrigation Scheme

5.3. Orissa Government undertook survey of Chhatarpur, Purshotampur, Hinjlicut and Aska Blocks in the Rushikulya Basin of Ganjam district in the year 1957. The study revealed possibilities of installation of pumping sets for direct pumping in deep water pockets in the bed of Rushikulya river.

5.4. Accordingly, in the year 1958, seven electric pumping sets of 10 H.P. each were installed in Rushikulya river as a pilot project. All these combined were to command an area of 156.85 acres. The cultivators evinced enthusiasm in utilising the pumped supplies. They started raising various cash crops such as *Saru,* Chillies, Sugarcane, vegetables etc. As a result, they made an average net profit of about Rs. 1,100, Rs. 900 and Rs. 700 per acre in growing *Saru,* Sugarcane, and Chillies respectively.

5.5. This led to increased demand for such pumping plants. Nine more pumping sets of 10 H.P. each were installed in 1960 to serve a total ayacut of 265 acres.

5.6. For operation and maintenance, the scheme was transferred to the Directorate of Agriculture in the Development Department. As a measure of extension programme installation of 22 more pumping sets in Chhatarpur and Ganjam Blocks, 59 in Aska Block, and 21 in Hinjlicut Block had been taken up in the year 1961-62. Reconnaissance surveys to further extend lift irrigation facilities in Palsara, Kasinagar and Bhanjanagar Blocks were said to be under way.

5.7. Soil in the command of these pumping sets is mostly sandy loam. It consumes more than the usual requirement of water. In Table 5.1. water requirements of various crops as collected at site in Rushikulya Basin are given.

TABLE 5.1

Serial No.	Name of the crop	Maximum No. of irrigation applied	Duration of crop (Months)	Total water requirement (in inches)
1	*Saru* (Arum)	120	6 to 7	90
2	Sugarcane	22	11	45
3	Chillies	33	5 to 6	24
4	Potato	12	5	24
5	Brinjal	18	4	36
6	*Mung*	2	4	2
7	Jute	5	4	10

5.8. Losses in the conveyance of water through sandy *kucha* water courses are high. State authorities may take steps to obviate these losses. May be, hand-spun sub-surface concrete pipe lines prove to be useful. Such pipe lines are extensively used on lift irrigation schemes in other parts of the country namely Coimbatore in Madras, and Anand in Gujarat.

5.9. Water is lifted by about eight ft. above ground level and delivered in a small surge tank. If it is directly dropped in a sump for delivery in the watercourse, any unnecessary lift could be avoided.

5.10. To meet the power breakdowns, mobile diesel operated pumping sets have also been provided in the scheme. These pumping points, as would be seen in the index map (Figure 5.1) are too close to each other. They have an ayacut of about 20—25 acres each. At an average a 10 H.P. motor has a pumping capacity of 20,000 gallons per hour. Although actual irrigating capacity of a pumping set has basic relation to its water output, the commands get defined primarily by natural considerations. As such either the commands should be integrated to provide sufficient service area to each pumping point or horse-power of each unit needs to be adjusted to the service area allotted to each.

5.11. At present highly water consuming crops are sown by the cultivators. Being sandy and porous, the retentivity of the soil is low. Through percolation much of the water finds its way back to the river. The Agriculture Department may evolve a suitable crop pattern and crop rotation to economise on the use of lifted water, keeping in view that adequate financial returns are yielded therefrom to the cultivators as well as to the State.

5.12. Three persons *viz.*, a driver, a helper, and an irrigation recorder @ Rs. 75, Rs. 45, and Rs. 70 p.m. are stated to be employed on each pumping station. This appears to be an expensive set-up. Appreciable economy could accrue if pumping points are grouped for supervision and operation. This grouping could be more extensive in the case of irrigation Recorders, as a charge of 25 acres ayacut is much too short for them. In Northern India an Irrigation Recorder has about three thousand to five thousand acres of contiguous area comprising a '*Halqa*' in his charge.

Nagavali Co-operative Lift Irrigation Scheme

5.13. Another lift irrigation scheme called 'Nagavali Co-operative Irrigation Scheme' at Rayagada, district Koraput was seen by the Team. It is a privately owned and operated scheme.

5.14. Due to the existence of Jeypore sugar factory at Rayagada, need was felt to have irrigation scheme in the area to produce more sugarcane. The Nagavali Co-operative Lift Irrigation Scheme Ltd., was formed in the year 1959.

5.15. Share capital of the Society is Rs. 6,00,000 divided in 3,000 shares of Rs. 200 each. Rs. 20 are payable per share in the initial stage and the balance is payable in three equal instalments, secured with mortgage of members land.

5.16. Yearly financial picture envisaged by the Society is given in Table 5.2.

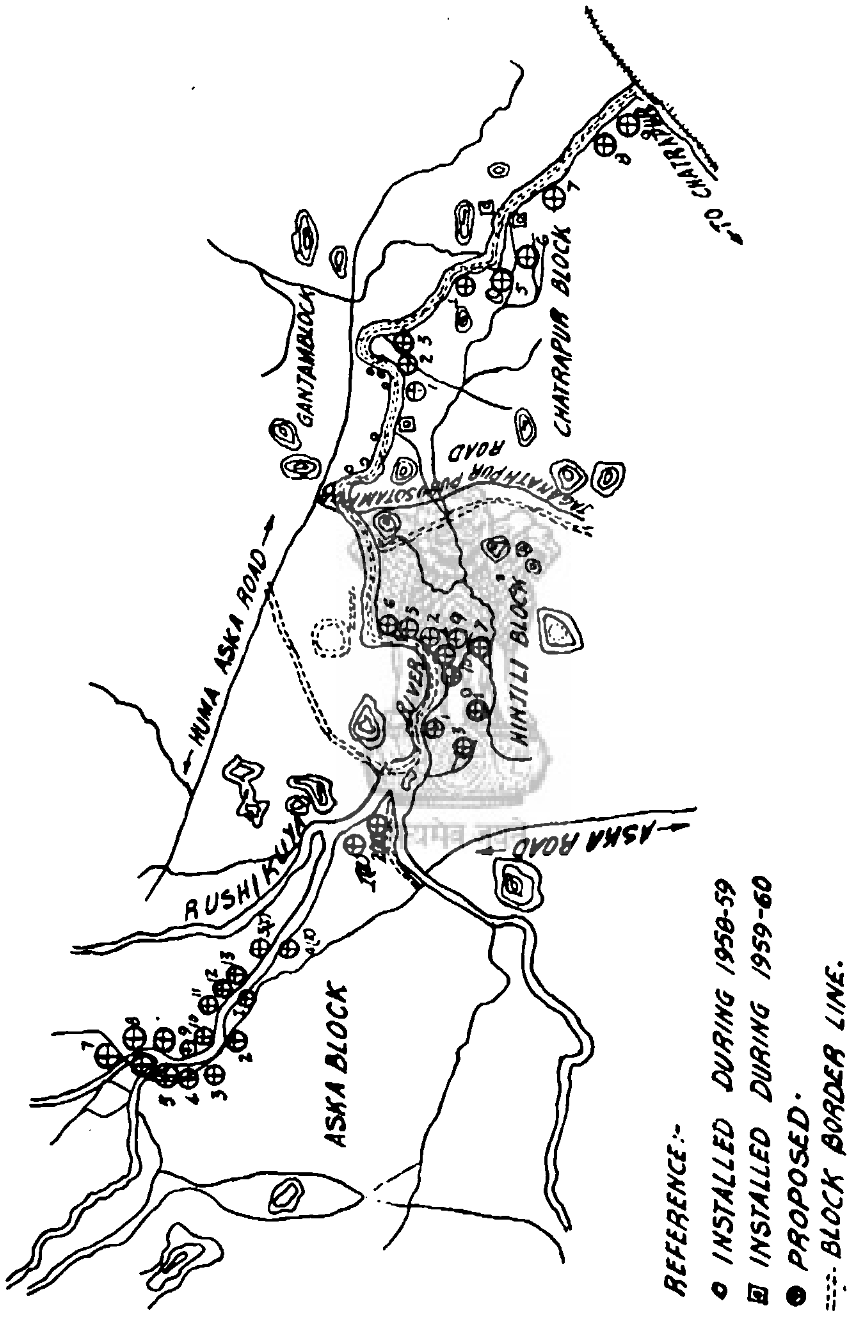

FIG : 5·1. Showing lift irrigation scheme, Rushikulya Basin

TABLE 5.2

Year	Amount available as per II (e) para.	Payment of loan & interest as per III para	Balance each year.	Progressive totals of balance each year.
1959 available for payments on15-2-60	1,38,446	80,000	58,446	58,446
1960 available for payments on 15-2-61	1,80,182	1,53,000	27,182	85,628
1961 available for payments on15-2-62	1,99,429	1,45,800	53,629	1,39,257
1962 available for payments on 15-2-63	1,99,429	1,38,600	60,829	2,00,086
1963 available for payments on 15-2-64	1,99,429	1,31,400	68,029	2,68,115
1964 available for payments on 15-2-65	66,130	74,200	..	2,60,045
1965 available for payments on 15-2-66	38,671	..	38,671	2,98,716
1966 available for payments on 15-2-67	22,471	..	22,471	3,21,187
1967 available for payments on 15-2-68	22,471	..	22,471	3,43,652
1968 available for payments on 15-2-69	22,471	..	22,471	3,66,128

Thus after the liquidation of loan by 15-2-1965 completely, the Society will own the pumping stations with all other assets without encumberances, besides having a cash balance of Rs. 2,60,045 towards depreciation of pumps and engines etc.

5.17. The scheme was to irrigate 3,050 acres of land from four pumping stations detailed below:—

Serial No.	Station	Irrigable block (acres)	Sugarcane (acres)
1	2	3	4
1	Chekkaguda	650	434
2	Thummiguda	600	400
3	Kothapeta	900	600
4	Komatlapeta	900	600
	Total	3,050	2,034

5.18. Keeping in view the transmission losses based on actual experience of irrigation in the locality, a duty of 40 at head of the pumping stations is presumed. The total water that will be required for irrigating 2,000 acres of sugarcane will, therefore, be 2,000/40 or 50 cusecs nearly.

5.19. A total of 44 inch depth of water per acre per year including 4 inches for losses would be given over 15 to 16 irrigations. Nagavali is a perennial river with an average summer flow of about 400 cusecs. Average flow during June—December is 4,000 cusecs. Thus the supply envisaged to be lifted in the four schemes would be a fraction of the supplies in the river.

5.20. To begin with, two schemes—Chekkaguda and Thummiguda were taken up for construction in February 1960. Cost thereof was Rs. 2,15,161 and Rs. 2,27,143, and cost per acre Rs. 496, and

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Rs. 568 respectively. At Chekkaguda one 125 H.P. electric motor has been fixed and an additional 120 H.P. motor with pump set is installed with separate 16″ diameter iron delivery pipe line to the elevated tank. Another 8″ diameter, well was built by the side of the old well to commission the new 120 H.P. motor set. It would irrigate 650 acres area, out of which 434 acres would be under sugarcane and remaining 216 acres under other light crops. Full targeted area has not yet been brought under irrigation due to land not being ready to receive irrigation.

5.21. Irrigation figures, assessment and annual M & R charges for two years are detailed below:—

Year	Irrigation	Amount assessed	Annual M & R charges
	(acres)	(Rs.)	(Rs.)
1959-60	145—83	11,384—25	1,132—27
1960-61	117—49	9,399—20	4,880—65

5.22. Thummiguda Scheme has been provided with two sets, one 165 H.P. and other 45 H.P. motor pump. 400 acres area out of 600 acres C.C.A. would be annually brought under sugarcane by rotation and rest 200 acres under other light crops. Performance of the scheme in 1959-60 and 1960-61 is as under:—

Year	Irrigation	Amount assessed	Annual charges M & R
	(acres)	(Rs.)	(Rs.)
1959-60	174—30	13,944·03	1,132·28
1960-61	305—88	20,730·40	4,880·66

(Electrical charges, interest on loan and depreciation etc. are not included in the M & R charges).

5.23. Water from the river Nagavali is pumped with electrical motors with heads varying from 54 to 85 ft. into overhead tanks to command the highest lands in each of the blocks, allowing for various losses in head of water. Water is conveyed from the overhead tanks into the ayacut through RCC pipe lines 24 inch to 21 inch diameter, about 5,000 to 6,000 ft. long and then through open *kucha* channels. In the RCC pipe lines, sluices at suitable commandable points have been introduced with leading channels from sluices to fields.

5.24. Two third area of the blocks would come under sugarcane having triennial rotation under plant in first year, 1st ratoon in 2nd year, 2nd ratoon in 3rd year, after which the land will be left fallow or will have light duration crops to keep the land fit for next sugarcane crop in the following year. Light crops would be raised in the remaining lands on which there will be no sugarcane.

5.25. Average yield of sugarcane in rainfed conditions under regular rainfall in this area was about 18 tons per acre, costing about Rs. 782. In the case of unfavourable rains per acre yield would go down to 7 to 8 tons. With assured irrigation facilities, the yield goes up to 35 tons and the extra yield of 17 tons per acre brings a profit of Rs. 738. With water rate @ Rs. 80 per acre and about Rs. 450 for additional cultivation expenses the cultivator gets a benefit of about Rs. 200 per acre, besides an assured crop.

5.26. The Co-operative Society may consider lining of *kucha* water courses to effect savings in the transmission losses.

Rana Basin Lift Irrigation Scheme

5.27. Rana Basin Lift Irrigation Scheme in Banki area is to provide lift irrigation to 2,638 acres on either side of river Rana, a tributary of Mahanadi. The area has been divided into 26 blocks. One pumping station of a capacity of one cusec is targeted to irrigate about 100 to 150 acres. Two 10 H.P. motors are proposed to be installed on each pumping station for alternate operation to ensure constant supply of water.

5.28. Only four such units have been completed so far. Their ayacut and pipe length details are given in Table 5.3.

TABLE 5.3

Sl. No.	Name of the pumping station.	Ayacut area (acres)	Total length of pipeline to be laid (feet)	Total length of pipeline already laid out (feet)	Further pipeline requirement (feet)
1	2	3	4	5	6
1	Nistipur I ..	126	1,500	1,500	500
2	Nistipur II ..	144	1,000	1,000	..
3	Karebar ..	100	1,500	1,200	2,500
4	Ramchandrapur ..	113	1,000	1,000	..

5.29. Soil of the ayacut is mostly sandy loam which consumes more water than the usual requirement. Yields of crops in this area are rather low as without proper irrigation schedule, manuring cannot be done.

5.30. Unirrigated sugarcane gives a yield of about 20 tons in Banki area. In the year 1962-63, irrigated acre yield of the first prize winner in sugarcane crop competition is stated to be 40.94 tons, which is double of the dry crop yield. There are vast potentialities of development of irrigation in this area. Banki is famous for production of quality *Gur*. With the coming up of irrigation facilities a *Khandsari* sugar unit is going to be installed at Banki.

5.31. The Agriculture Department has proposed the following cropping pattern for the ayacut areas:—

Sugarcane	**50** *per cent of the area.*
Jute	**20** *per cent of the total area in kharif*
Biali paddy	**30** *per cent of the total area in kharif*

In *rabi*, jute areas are proposed to be followed by potatoes, *mung* and *dalua* and *biali* paddy by tobacco, wheat, groundnut and chillies.

5.32. Cost break-up of the pumping station is as under:—

		Rs.
Chamber including two pumps		7,000
Cost of pipe lines 1,500 ft. @ Rs. 5·75 per foot		8,625
		15,625
	Say	15,700
Maintenance & repairs		300
	Total	16,000
Ayacut area		126 acres
Capital cost per acre $\frac{16,000}{126}$ = Rs. 127	or Say	Rs. 130

5.33. The Team feels that economy could be effected if one motor is installed at each station instead of two. With proper maintenance and repairs it may be possible to work with one motor as is done elsewhere. Besides, stand-by arrangement of one or two mobile sets may be provided. Appreciable saving could also be made if lined watercourses or hand spun concrete pipe lines replace the costly RCC pipe lines.

5.34. Water rates to be levied on irrigation of principal crops on Banki Lift Irrigation Scheme, and Rushikulya Lift Irrigation Scheme, are given below.

Serial No.	Name of the crop	Water rate on Banki Scheme	Water rate on Rushikulya Scheme
1	2	3	4
1	*Saru*	Rs. 163 per acre	Rs. 150 per acre
2	Sugarcane	Rs. 80 per acre	Rs. 75 per acre
3	Chillies	Rs. 52 per acre	Rs. 45 per acre
4	Potato	Rs. 45 per acre	Rs. 45 per acre
5	Other vegetables	Rs. 28 per acre	Rs. 2 per acre inch
6	*Dalua* paddy	Rs. 58 per acre	Rs. 2 per acre inch

5.35 It is estimated that on Banki Scheme 82,626 acre inches will be needed for the area per year and an amount of Rs. 1,65,252 will be realised as receipts assuming that Rs. 3 will roughly be the cost of an acre inch of irrigation. On Rushikulya Scheme, per acre-inch of irrigation rate has been assumed as Rs. 2. There is thus much variation in the water rates fixed on the two lift irrigation schemes, which are almost identical in nature.

Rayagada Lift Irrigation Scheme

5.36 Rayagada lift irrigation scheme sponsored by the Public Works Department in Koraput district was visited by the Team. To feed Jeypore sugar factory at Rayagada, surveys were conducted to explore possibilities of assured irrigation supplies for extension of sugarcane cultivation. The factory management incurred an expenditure of about Rs. 60,000 on the investigation to have a reservoir on Gedda stream, a tributary of Nagavali river. On further examination the strata and site were found unsuitable and the scheme was dropped.

5.37. As an alternative, two lift irrigation schemes were examined and implemented. P.W.D. took in hand installation of lifting pumps in Gedda stream, and the Nagavali Co-operative Lift Irrigation Society Ltd., in Nagavali river. The latter scheme has already been dealt with in this chapter.

5.38. Rayagada lift irrigation project was completed in December 1960 at a cost of Rs. 2,02,290, as per revised estimate.

5.39. Two electric motors of 165 and 75 H.P. have been installed to pump water to a height of 55 ft. to feed the lower level canal. Two more pumping sets of 35 and 20 H.P. have been installed to lift water further by 35 ft. for the high level channel. 75 H.P. motor for the first phase, and 20 H.P. motor for the second phase lifts are stand-by arrangement. Discharge of the first stage lift is 11 cusecs, and of the second stage 7 cusecs. Length of the low level canal is 14,700 ft. and of the high level canal 8,700 ft. Gedda stream on which the project is built is perennial. Rainfall of the zone is about 46 inches annually.

5.40. Annual irrigable area on the scheme is 800 acres. Cost per acre comes to $\left(\frac{2,02,290}{800 \text{ acres}}\right)$ Rs. 252.88, say Rs. 253. The scheme was commissioned in December, 1960. Its irrigational and financial performance is given in Table 5.4.

TABLE 5.4

Year	Irrigation (acres)	Amount assessed (Rs.)	Expenditure: Int. on capital @ 4½% (Rs.)	Annual M&R (Rs.)	Special Repairs (Rs.)	Cost of establishment (Rs.)	Cost of electricity consumed (Rs.)	Total (Rs.)	Profit or loss (+) or (-) (Rs.)
1960-61	200	20,022·96	..	..	..	..	..	..	
1961-62	300	20,028·96	..	..	..	..	..	..	(+)6,719·50
1962-63	350	39,000·00	9,103	1,000	2,050	4,000	16,127·50	32,280·50	
1963-64	420	N.A.							

5.41. It will be seen that irrigation which was 200 acres in 1960-61 has gone up to 420 acres in 1963-64. Although there has been steady increase in it year after year, the development in four years is just 50 per cent of the targeted figure of 800 acres.

5.42. When such an ambitious scheme was being implemented, land levelling, construction of field channels, creation of instinct of pre-preparedness amongst the beneficiaries to utilise irrigation supplies should have received due attention side by side, to cut the time factor to the minimum.

5.43. There is a marked margin of profit in changing from dry to irrigated sugarcane, and in view of the keen demand from the Jeypore sugar factory, the project should have fully developed by now. The authorities may take necessary steps to ensure optimum utilisation of the pumped supplies. To save upon the transmission losses, phased programmes of lining of channels may be worked out.

5.44. Financial picture of the project has been made available only for the year 1962-63. Against an expenditure of Rs. 32,280.50, the return to the State Exchequer has been to the order of Rs. 39,000, leaving a profit of Rs. 6,719.50. Better return to the State Government and also to the beneficiaries, would accrue when the project attains targeted irrigation.

5.45. Rayagada lift irrigation project formerly in the charge of the Public Works Department has since been transferred to the Directorate of Lift Irrigation. This full fledged Directorate of Lift Irrigation has recently been created. Previously lift irrigation was being looked after by the Joint Director Lift Irrigation in the Directorate of Agriculture.

Floating Barges Fitted with Pumpsets

5.46. Lift Irrigation Directorate of Orissa State is evincing enthusiam in the furtherence of lift irrigation schemes with the introduction of floating barges fitted with pumpsets. At places where there is no electricity, diesel operated pumpsets are installed on the barges. Two type of barges of "House Boat Type" have been designed and fabricated. Electric installations in the pump chambers constructed over the barges have been made.

5.47. The pumps fitted in the barges are of Monoblock type, which are light in weight and each of which has a delivery capacity of 20,000 to 23,000 gallons per hour against a head of 40 ft. to 50 ft. These pumps are capable of taking care of varying heads from 40 ft. to 100 ft. and can thus function during different seasons with fluctuations of water level in the streams. Water is delivered for irrigation through multipoint alkathene pipes. Photographs of an irrigation barge in position on a stream and water being delivered in an irrigation channel are shown in Figs: 5.2 & 5.3.

5.48. In the units where four pumps are being operated simultaneously, the delivery capacity is 80,000 gallons per hour. In the smaller units of two pumps it is 40,000 gallons. These barges can command from 100 to 200 acres in compact blocks.

5.49. The estimated cost of the barge fitted with:—

(i) two electric pumps is Rs. 10,581,
(ii) four pumps of 10 H.P. each is Rs. 19,231, and
(iii) two diesel pumps of 15 H.P. each is Rs. 23,900.

5.50. The Team had the occasion to visit in May 1963, one such floating unit known as '17th point' in village Chandanpur on the right bank of Brahmani river. Two electric motors of 10 H.P. each are fitted on the barge. Each pumpset is capable to deliver 22,700 gallons per hour. It was put into operation in April, 1963. At the time of Teams' visit about 30 acres *dalua* paddy was receiving irrigation. *Dalua* paddy is sown in April and harvested in early June before the break of monsoons.

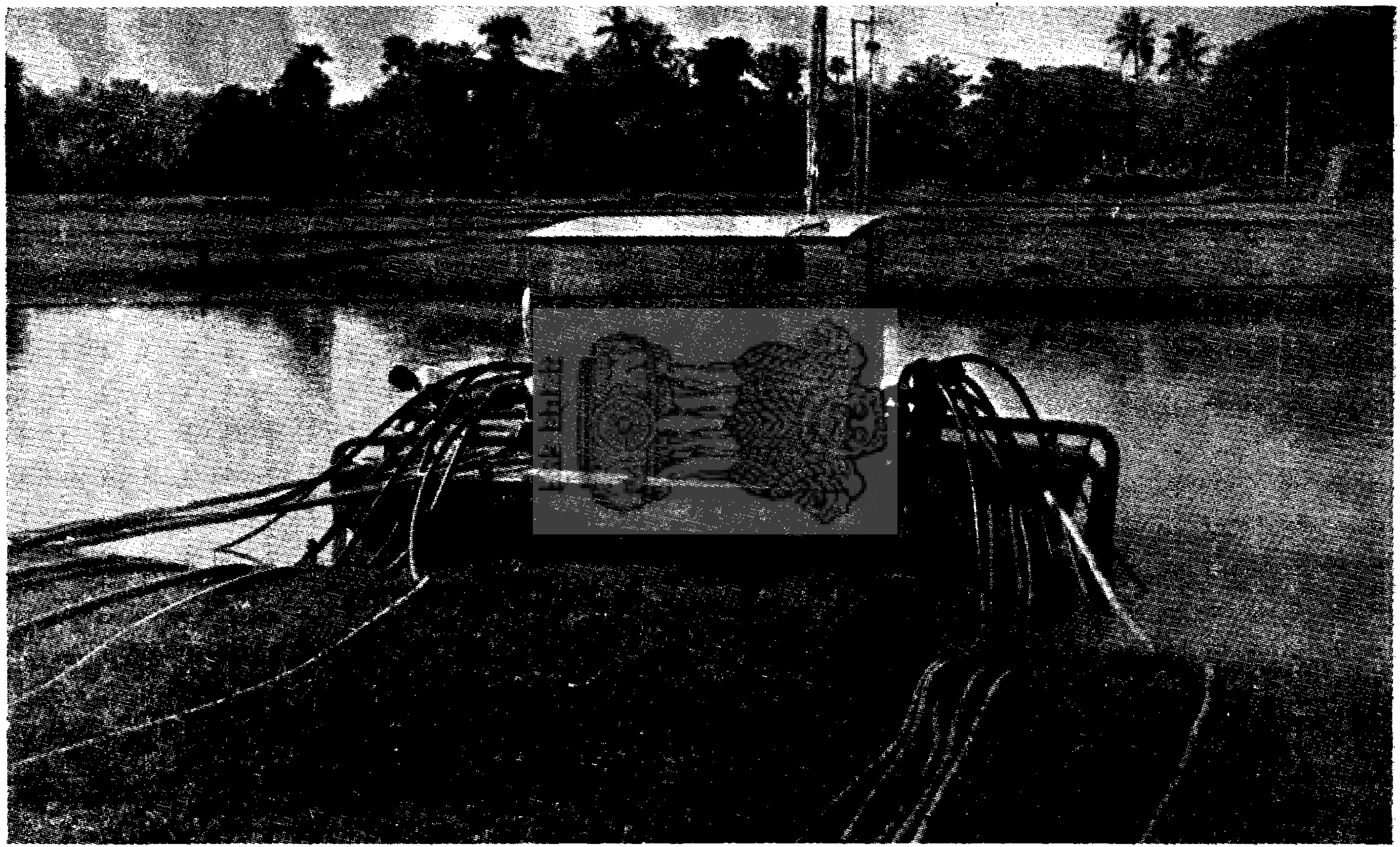

FIG. 5·2· An Irrigation Barge in position.

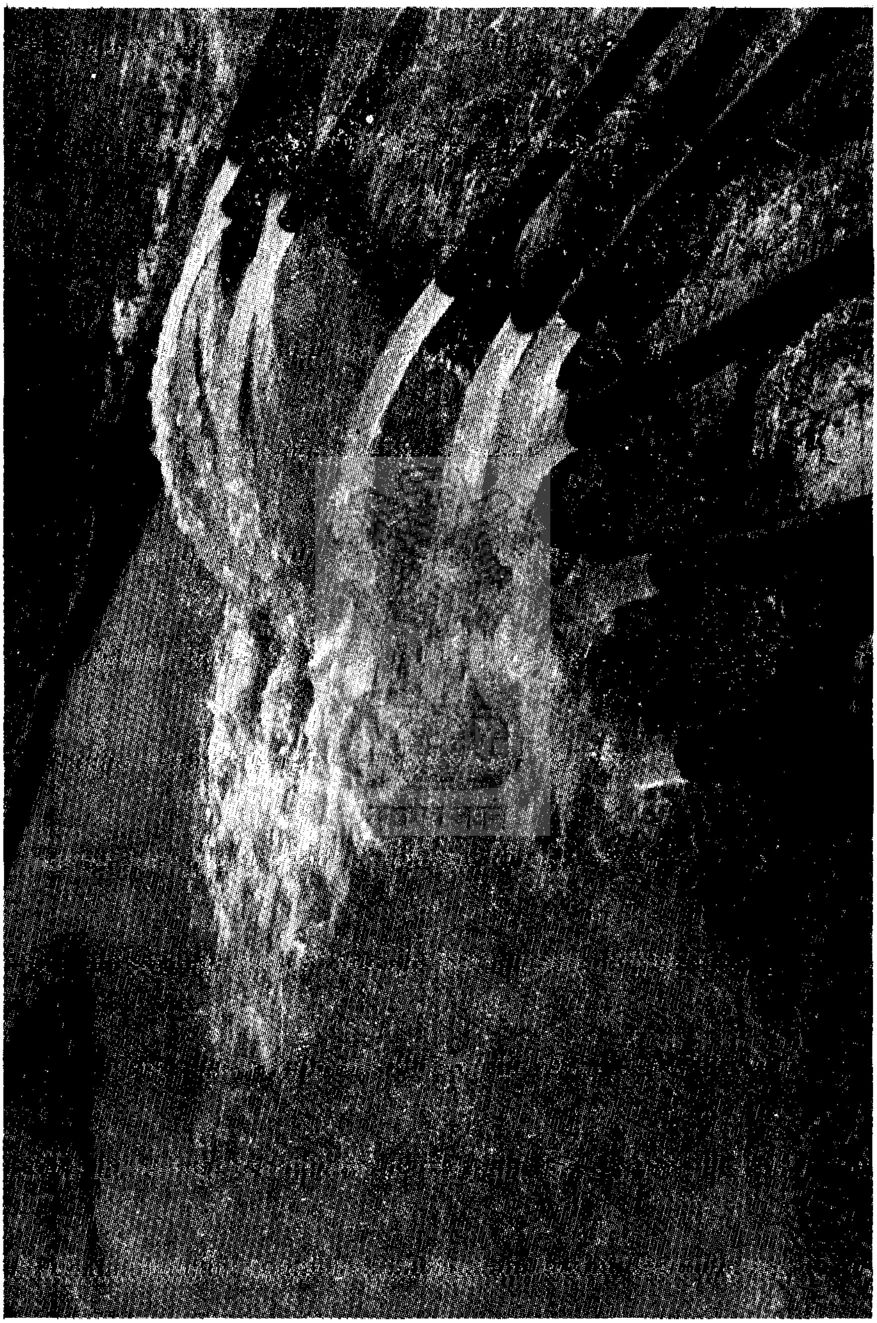

FIG. 5·3. Multipoint delivery through Alkathene pipes.

5.51. The areas to be served by these barges (17 points in all) on the bank of Brahmni river are stated to remain submerged during the flood season from June to September, sometimes under 15 ft. deep water. The R.C.C. pipe line and the sumps would thus remain submerged for about 4 months in a year. It is to be seen what effect this submergence has on these structures.

5.52. *Dalua* paddy could be followed by *Sarad* paddy and thereafter by vegetables and potatoes. *Dalua* takes 60 days to mature and *Sarad* paddy 120 days. The later is more or less rain-fed crop. With provision of water through barges, there is ample scope of development of irrigation in this area, which otherwise had no source of irrigation.

5.53. When lift irrigation projects are made over to the Co-operative Societies for operation and maintenance, the financial burden on the State will gradually get lightened. Lift irrigation schemes though of recent origin, have proved of use, and in certain localities where there are perennial supplies available in the streams, they can be developed further.

5.54. Care, however, has to be taken to ensure that water is not unnecessarily lifted. If the area is such as can be commanded from two different elevations, water need not be pumped to the higher elevation.

5.55. Again, it may not be necessary to instal two units for every site. In fact, provision of spares and a stand-by plant for the scheme may seem to serve the purpose. The staff employed on lift irrigation schemes could also be curtailed by entrusting to each individual a bigger jurisdiction than they are holding at present. There is considerable scope for adopting a more profitable crop pattern, so as to yield the optimum return both to the State and to the irrigators.*

5.56. Field operations for a couple of years will infact bring out operational difficulties, if any. As it is, unless the full area expected to be commanded makes use of the facility, the economics of the scheme may prove to be unpromising. The personnel operating the barges and field staff distributing the supplies will need to be supervised, so that the scheme does not suffer on account of usual human frailities.

CHAPTER VI

Planning and Prospecting of Minor Irrigation Works

6.1. Rainfall in monsoon season is generally good and well-distributed in the State of Orissa. It thus proves favourable for the *kharif* crop, which is mostly paddy. Need for supplemental irrigation during *kharif* is, therefore, only rarely felt. Since people have been accustomed to a rain-fed pattern of agriculture, there has not been much development of *rabi* or winter season cropping in the State except in the deltaic region. Many streams and rivers flow in Orissa. Also topography of the area other than of deltaic region, offers many suitable sites for construction of diversion works and storage reservoirs to serve the needs of irrigation, if *rabi* cultivation is planned on a systematic basis.

6.2. Keeping in view the foregoing observations the State can have a broad planning policy in respect of minor irrigation, to serve the needs and purposes as outlined below:—

(*a*) Small diversion canals and weirs on streams and rivers can be built for supplemental irrigation of *kharif* crop, wherever feasible to protect *kharif* crop in case of drought.

(*b*) Small reservoirs and tanks can also be planned for feeding diversion canals or providing direct *rabi* irrigation in suitable locations. Such tanks in the ayacut of diversion canals could be used with advantage for storage of canal water, which may be needed later, when the canals may not be running.

(*c*) To make use of the subsoil water through open percolation wells or tubewells wherever possible.

(*d*) To provide direct lift irrigation from streams and rivers either by individual cultivators or through lift irrigation schemes operated either by the State or by the Irrigation Cooperative Societies.

6.3. These different categories of minor irrigation works are apparently being planned as dictated by the site conditions. But the sample studies of different categories of minor irrigation works as detailed in foregoing Chapters indicate that the utilisation of potential appears poor on many of the schemes, particularly on State tubewells on which the utilisation is practically nil, while the cost on them is rather high. *Appendix V* contains a table showing cost per acre of area likely to be benefited from various schemes visited by the Team.

6.4. Minor irrigation works planning policy is, therefore, to be oriented to suit the ultimate utilisation pattern of different categories of schemes and their financial returns (direct and indirect). It may need change and improvement in the existing agricultural norms and practices, to attain financial solvency. Irrigation works, no doubt, have an insurance value but a limit is always to be set even on insurance premium. A State cannot afford to lose on its irrigation development, when its economy is mostly based on agriculture. Planning and prospecting of irrigation works in the State should, therefore, be based on a sound basis so that at least the overall National return may commensurate with National investment, even though the direct financial return to the State may not be sufficient to justify the capital investment.

Desilting of Old Tanks

6.5. 'Special attention needs to be given to the assets already existing by way of minor irrigation works, more particularly in the southern part of the State. Heavy silt deposits have occurred in the beds of tanks and reservoirs thus reducing their capacities and consequently their area of serviceability. There are instances where entire tank beds are now under cultivation and the works can be indentified only from the remanents of the dilapidated masonry structures. It would seem desirable if steps are taken on an organised basis to restore these storage tanks, preferably through a composite scheme of desilting-cum-reclamation.

Irrigation Code

6.6. Provisions of Orissa Irrigation Act No. 14 of 1959 followed by Orissa Irrigation Rules of 1961 need to be enforced in a systematic manner, so as to achieve a unified application of the same. A wide publicity thereabout also seems to be called for.

Land Acquisition Act

6.7. Action is also required to be taken to amend Land Acquisition Act so as to facilitate acquisition of land required for irrigation works and where necessary for providing field channels without which the development of irrigation suffers.

Cattle-Trespassing

6.8. Another significant factor which particularly offsets all efforts with regard to development of *rabi* cultivation is cattle trespassing. Though an Act regarding trespassing exists in the State, yet cattle are let loose by and large, during winter months. Even Government farms like Rajendra Experimental Seed Farm at Bolangir are not immune from its hazards. Where plans for winter cropping have to be evolved it may seem prudent to make a start with adequate percentage of fodder crops, so that cattle have not to be let loose to pick up their feed from others' field. This may go a long way in leading people into a venture of double cropping wherever favourable conditions exist, more particularly in areas provided with irrigation facilities. This will in its turn, help utilisation of irrigation potential, which otherwise remains unutilised on many irrigation works, big or small.

Unified Control

6.9. In the State of Orissa there are a number of agencies *viz.* P.W.D., Rural Engineering Organisation, Revenue Deptt., Agriculture Department and Community Development Department that look after minor irrigation works of different categories. For a planned development of irrigated agriculture it would seem prudent to integrate all sizable irrigation works into an organisational set-up as is being attempted through the creation of Rural Engineering Organisation in the State. A statement prepared by the R.E.O., in respect of 1177 minor irrigation works so far surveyed, indicates a work programme of over Rs. 3.39 *crores* (district wise abstract given in *Appendix VI*). Completion of the survey would bring out full picture of the state of affairs and total requirement of funds for streamlining the works already executed. It would seem more desirable if the new organisation is dovetailed into Irrigation Department of the State, so that a comprehensive plan for development of irrigated agriculture in the State could emerge therefrom.

Water-rates

6.10. Water rates levied on irrigation works do not serve merely as a source of revenue but also fulfils the purpose of creating consciousness among the users of irrigation water for its better utilisation. The rates, however, have to be on a rational pattern so that they are in conformity, by and large, with the expenditure incurred by the State on the production and supply of water, leaving at the same time some margin of revenue for the State Exchequer.

6.11. The practice of supplying water free of cost leads to an attitude of free service, which is little cared for. It would seem better if full water rate structure is worked out and publicised and is imposed from the very beginning. Remissions in suitable stages, say 100 per cent in the first year, 75 per cent in the second year, 50 per cent in the third year and 25 per cent in the fourth year may, however, be allowed to help growth of irrigation and development thereof. This practice is followed in some of the States in western India and helps development of irrigation within a period of 5 years or so.

Field Channels

6.12. Planning of field water channels with a view to attain a sound management of irrigation supplies at the field level is an integral part of planning of irrigation schemes. Without proper management the end-use of irrigation supplies is generally poor. The provision in the Orissa Irrigation Act 14 of 1959, section 4(7) envisages that water courses will be constructed by the persons to be benefited at their own cost. The actual effect of this provision in the field, however, is negligible, and action as envisaged in Orissa Irrigation Act of 1959 under section 11 read with section 15 seems to be widely called for, and needs to be taken in the interest of development of irrigation wherever necessary.

6.13. A programme of establishing trial-cum-demonstration farms in the ayacut of various irrigation projects, wherever possible, will seem necessary to be implemented with a view to provide at-site information and training to the cultivators. This is an important aspect, because a large number of cultivators suffer for want of scientific water management knowledge. A coordinated programme of trial-cum-demonstration farms need, therefore, to be worked out wherever development of irrigation is lagging.

Coconut Research Station

6.14. Apart from cashewnut and citrus plantations in areas protected by irrigation works, there is considerable scope for developing coconut plantation, particularly in the coastal areas. The Coconut Research Station at Sakhigopal can provide considerable lead in quality improvement of the existing varieties and even introduction of Arab date palms.

Central Rice Research Institute

6.15. Orissa is fortunate in having the Central Rice Research Institute at Cuttack, which was established by the Government of India in 1946. Besides undertaking fundamental studies, the Institute has carried out integrated investigations of the rice crop in relation to soil, its maintenance, plant nutrition, water, climate, environmental conditions, insect-pests and diseases etc., with a view to bringing about improvement in the cultural practices for increasing production and maintaining fertility of the soil. Some of the results obtained at the station are of far reaching importance. The studies conducted on nitrogen changes in the water-logged rice lands, have shown that apart from denitrification, nitrogen losses occur in drainage waters to the extent of 10 to 12 per cent especially when there is heavy down-pour of rain within 24 to 48 hours of fertilizer application. Agronomic experiments have indicated that the placement of fertilizers in the sub-surface zone at the time of puddling or post-planting stage enhances the effectiveness of the nitrogenous fertilizer by 60—100 per cent in comparison with surface application. The Team, during their tours noticed that generally rice was being grown by the cultivators on the same land year after year without any systematic rotation. The Cuttack Research Institute has shown that it is possible to have a well planned sequence of cropping on the rice lands and where irrigation water is available, it is possible to grow after rice, such crops as cotton or groundnut which give high economic return. Growing of two crops of rice in succession, with green manure crop in between has also been found feasible. Such practices, if adopted on a large scale, could result not only in considerable benefit to the cultivators but also increase in production. The Institute occasionally runs a course of practical training in improved methods of rice growing for educating the farmers collected from different Blocks in the State and also holds refreshers courses periodically for the extension staff of the Agriculture Department and Community Projects in Orissa. It is, however, felt that efforts are required to be made on a much bigger scale than hithertofore to derive full benefits from the findings of the institute, by giving wide publicity and arranging large-scale practical demonstrations in the farmers field.

Green Manure

6.16. The rainfall pattern of the State (*Appendix III*) has been referred to in some detail in *para* 1.4 Chapter I. December and January are practically dry and only small amount of rain is received in the months of February and March. Thus such crops as groundnut and cotton can be raised in winter season supplemented with artificial irrigation. In the months of April and May light thunder showers is a common feature in the State, which could with advantage be utilised for sowing green manure crops.

6.17. Prospecting and planning of irrigated Agriculture calls for closest co-ordination between the activities of Irrigation and Agriculture Department. The Teams' observations reveal considerable ground which is to be covered in this respect. As it is, it will seem prudent if schemes are sanctioned only when they are vetted by the two departments in respect of their feasibility, workability and eventual field productivity.

Summary of Recommendations

Apart from mineral resources, the State of Orissa has vast natural resources of land and water, which have not so far been amply exploited. A concerted multi-faced programme—both in industrial and agricultural fields—to utilise the available resources can turn Orissa into a prosperous State. This study pertains primarily to the development of small irrigation schemes and main recommendations as emerge out of the study, are listed below:—

I. Irrigation schemes need be taken up only after adequate agro-technical investigation and scrutiny. That will help excluding unpromising schemes and will ensure a better standard of works.

(*Paras* 2.20, 2.129, 2.131, 3.97 to 3.99).

II. Possibilities of creation of storages in the upper reaches of the streams may be looked into to augment supplies in the diversion weirs. (*Para* 2.55).

III. On Irrigation works piece-meal sanctions need be avoided so as to enable estimates being framed on a comprehensive basis.

(*Para* 2.100).

IV. On streams where irrigation works are located action need be taken to extinguish less fruitful riparian rights in upper reaches, which otherwise tend to cause obstruction and reduction in flow of water, particularly during critical periods of demand.

(*Paras* 2.77 *and* 2.78).

V. Direct lifting of water from canals needs to be prohibited to ensure regulated irrigation supplies to the areas catered for.

(*Paras* 2.79, 3.71, *and* 3.84).

VI. On non-perennial streams retention of tanks for conservation of water for use in the ayacut of irrigation works, may be encouraged. (*Para* 2.80).

VII. (a) Construction of wells to supplement canal irrigation may be promoted and subsidised in the ayacut, where there are possibilities to tap subsoil resources of water.

(*Para* 2.81).

(b) Otherwise too, efforts need be made to utilise, wherever feasible, the subsoil resources of water through open wells, which constitute the common man's commonest resource for irrigation.

(*Paras* 4.37, 4.40 *to* 4.42).

VIII. Specific rules and regulations for the operations of State Tubewells need to be introduced.

(*Para* 4.26).

IX. Pre-preparedness is necessary to be carried among the beneficiaries to make use of irrigation supplies as they become available.

(*Para* 5.42).

X. Scrutiny of actual ayacut of minor irrigation works need be completed speedily, so that areas outside the authorised command and receiving irrigation, do not escape assessment any longer.

(*Paras* 2.120, 3.22 *and* 3.69).

XI. Maximum periods of development need to be fixed for tubewells, lift irrigation schemes, and other irrigation works, so that there does not occur an undue lag of time between creation of potential and its utilisation and efforts are mobilised by all concerned to achieve targeted development within scheduled time limit.

(*Paras* 4.23, 4.27 *and* 5.41).

XII. Water rate structure under examination in the State needs to be fixed on rational basis.

(*Paras* 5.34, 5.35 *and* 6.10).

XIII. Effective recourse to the provision of section 4(7) and 11 of Orissa Irrigation Act XIV of 1959 with respect to construction and maintenance of watercourses, is called for to have well laid-out field channels on minor irrigation works to replace the wasteful practice of field to field irrigation.

(*Para* 6.12).

XIV. Re-modelling of canals, wherever necessary, needs to be done to bring them in proper section, slopes and depths.

(*Paras* 2.39, 2.41, 2.46, *and* 3.32).

XV. (a) Where silted areas of tank beds are under unauthorised occupation, suitable action is called for to get the encroachments vacated.

(*Paras* 3.41, 3.51 *and* 3.56).

(b) Such areas after recovery, if not required for submergence again, could be profitably disposed of to cover at least some portion of the expenditure incurred on renovation of such old storages.

(*Para* 3.42).

XVI. A judicious combination of desilting-*cum*-reclamation of silted tanks needs to be undertaken with a view to regain the lost capacities of the reservoirs.

(*Paras* 3.42 *and* 6.5).

XVII. (a) Recording of actual irrigation on minor irrigation works is necessary to have a correct appraisal of their yearly serviceability.

(*Paras* 3.19, 3.21, 3.57, 3.58 *and* 3.62).

(b) Suitable procedure for physical check of booked up irrigation also needs to be introduced.

(*Para* 3.63).

XVIII. Where irrigation by gravity flow is possible even at some extra cost, lift irrigation need not be provided.

(*Para* 3.74).

XIX. Time-lag in completion of works and energisation of tubewells need to be cut to the barest minimum, to ensure early utilisation of the resources created.

(*Paras* 4.13, *and* 4.15).

XX. Irrigation works—big or small—need to be brought under a unified control of one department having competent technical personnel at all levels, preferably Irrigation Department, as is practised in the States of northern India, Bihar and Gujarat. Coordination of Irrigation and Agriculture Departments at all levels is called for, to achieve implementation of effective development of irrigated agriculture in the State. (*Paras* 2.130, 6.9 *and* 6.17).

XXI. On lift irrigation schemes if the area is such as can be commanded from two different elevations, water need not be pumped to higher elevation. (*Paras* 5.9 *and* 5.54).

XXII. (a) Effective steps need to be taken to protect winter cropping areas against cattle grazing.

(*Paras* 4.17 *and* 6.8).

(b) Wherever winter cropping is to be encouraged a start need be made with adequate percentage of fodder crops.

(*Para* 6.8).

XXIII. Some of the results of research work carried out at the Central Rice Research Institute, Cuttack, in regard to cultural practices particularly about the placement of fertilizers in the sub-surface zone, are of far reaching importance and need to be widely publicised and adopted. (*Para* 6.15).

XXIV. The practice of taking two crops of paddy with green manure crop in-between, or of growing cotton or groundnut after paddy in winter, requires to be encouraged in the irrigated areas.

(*Paras* 6.15 *and* 6.16).

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Terms of Reference

(*Irrigation Team*)

The minor Irrigation Projects may be divided for study into two parts:—

(*a*) Works already in existence.

(*b*) Works which are now being constructed.

2. Case studies should be made of a number of projects of each type under the above headings with a view to judging their efficiency having regard to the objectives with which such works were carried out.

3. The following points should be especially borne in mind:—

Existing Projects

(*i*) The present state of repair and maintenance.

(*ii*) The system of keeping works in proper maintenance with particular reference to the customary obligations of villagers for keeping such works in a sound condition from year to year, the team should also examine the extent to which these obligations are enforced, the reasons for the failure to do so and the steps that should be taken to carry out such obligations efficiently.

(*iii*) Reasons, if any for non-utilisation of water by cultivators.

(*iv*) Improvements necessary to make the projects more efficient either in the matter of better agricultural planning and practices or in respect of engineering works.

(*v*) Cost of restoration if the project is in a state of disrepair and whether it has been included in the Plan.

New Projects

(*i*) Method of selection—procedure and principles on which priorities are based.

(*ii*) Flow chart of the construction Project should be prepared to examine whether any avoidable delay has occurred in its completion.

(*iii*) Whether fullest use is made of catchment capacity in preparing designs.

(*iv*) Economics of design.

(*v*) State of agricultural planning with a view to optimum utilisation of benefits.

(*vi*) Institutional arrangements provided for the proper maintenance of new works with special reference to the customary obligation of villagers in this regard.

(*vii*) Cost of actual construction compared to estimated costs—the reasons for increase if any and the care with which the initial estimates were framed.

4. Any other matter which the Team considers necessary to report upon having a bearing on economy and efficiency of such projects.

5. The following information should be gathered by the Team for each State, taken as a whole in regard to existing minor irrigation works:—

(*i*) The total area irrigated from them according to Settlement registers.

(*ii*) The area actually irrigated from year to year beginning from 1947.

(*iii*) The reason for the reduction, if any, in the area irrigated.

6. In addition, the Team will carry out a study of the tubewell schemes of the Punjab and the U.P. with reference to the fact whether optimum use has been made of the facilities available by ensuring scientific crop planning and by improving agricultural practices. The study should be based on an examination of individual tubewells, which may be divided into most successful, successful and least successful varieties for the purpose of study. The Team should also select a few tubewells for which alternative crop planning and practices may be recommended that are being carried out at present in order to make them more successful. The consideration mentioned regarding minor irrigation works in paragraph 3 *mutatis mutandis* be taken into consideration for the study of tubewells also.

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Appendices

I Minutes of the meeting held at Bhubneshwar (Orissa State) on the 17th March, 1962.

II Minutes of the meeting held at Bhubneshwar (Orissa State) on the 6th August, 1963.

III Annual rainfall Normal for 50 years (1901 to 1950), Orissa State. **(1.4 and 6.16).**

IV A short note on Minor Irrigation Projects in Orissa during different Plan Periods. **(3.105).**

V Statement showing capital cost per acre of the various types of Minor Irrigation Works visited by the Team. **(6.3).**

VI District-wise requirement of funds for improvement and renovation of disuse Minor Irrigation Projects. **(6.9)**

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APPENDIX I

Committee on Plan Projects

(IRRIGATION TEAM)

Minutes of the meeting held at Bhubneshwar, Orissa on the 17th March, 1962

The following were present:—

Orissa State

Shri Pabitra Mohan Pradhan, Minister, Agri. & Animal Husbandry Deptt.

Shri B. Sivaraman, I.C.S., Chief Secretary and Development Commissioner.

Shri M. Ramakrishnayya, I.A.S., Secretary, Planning and Co-ordination and Additional Development Commissioner.

Shri G. C. Das, I.A.S., Secretary to Government, Agriculture & Animal Husbandry Department.

Shri L. K. Mahanti, Deputy Development Commissioner.

Shri S. N. Mishra, Dy. Secretary to Government, Works Department.

Shri H. K. Mohanty, Joint Director, Agriculture, (Engineering).

Shri B. N. Sahu, S.E., Rural Engineering Organisation, Planning and Coordination Deptt.

Shri P.K. Swain, Under Secretary, Agriculture and Animal Husbandry, Department.

Committee on Plan Projects

Shri M. Thirumala Rao, M.P., Leader, Minor Irrigation Team.

Shri Baleshwar Nath, Member, Minor Irrigation Team.

Dr. Arjan Singh, Member, Minor Irrigation Team.

Shri Mahavir Prasad, Member, (ex-officio), Minor Irrigation Team.

In attendance

Shri J. R. Kumar, Research Officer, Minor Irrigation Team.

Shri R. S. Singh, Research Officer, Minor Irrigation Team.

Shri R. P. Bhatnagar, Economic Investigator, Minor Irrigation Team.

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SHRI PRADHAN, Minister for Agriculture, who holds charge of the Minor Irrigation also, welcomed the Leader and the Members of the Minor Irrigation Team. Speaking about his State he said that it is full of natural resources with so many rivers, rivulets and *nallahs.* There thus exists big irrigation potential. Four districts out of thirteen have plain areas. Ganjam district, he added, has developed appreciably in irrigated agriculture and there is still good hope for extension. Its area is both plain and undulating and so is Sambalpur district. Cuttack district is also plain.

SHRI M. THIRUMALA RAO, Leader of the Minor Irrigation Team enquired about the lining of channels in the State with a view to save losses of irrigation water. The Minister replied that where abnormal seepage is encountered and it is found necessary, lining of channels is resorted to. To his other query about the number of tanks in the State, the Minister said that they are not less than twenty thousand in number in the whole State. The tanks in Orissa, he added were multipurpose tanks, used for domestic and irrigation purposes and for pisciculture. These tanks serve the purpose of irrigation admirably in the years of drought. Paddy he said, is the main crop grown in the State for which generally there are ample and timely rains, and cultivators do not require irrigation water for maturing paddy. Since the rates of vegetables have gone up considerably, the cultivators are taking to it at some places now. The Minister added that more diversion canals are needed in about nine districts of the State, and for that ample money is required. Since the supply in the streams and *nallahs* dwindles down in the months of January and February and there is not enough water in the tanks for paddy cultivation, bunding of the streams also needs to be done wherever feasible.

"What would be the results of the investment and how much extra revenue would accrue to the Government"? asked Shri M. Thirumala Rao. The Chief Secretary replied that, so far water rates are not levied in the State. Legislation for the levy of irrigation cesses has been enacted and will be enforced in a year's time. Survey staff has been put to classify the various kinds of irrigation, *viz.*, perennial, commencing with rains, short term crops and insurance against droughts. The inadequacy of staff had been a problem in the State, he added. Projects for land reclamation were taken up and executed. Now lands have been made fit for cultivation and irrigation cesses could be charged thereon. Maintenance of the Minor Irrigation Works, which was formerly done by the beneficiaries through the village headman, who was levying compulsory labour came to be stopped in 1946. In the Third Five Year Plan Rs. 80,00,000 have been provided for the Minor Irrigation Works added the Chief Secretary.

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Shri Baleshwar Nath enquired about the area covered by the Minor Irrigation Works in the State in the Plan periods, and their performance. The Chief Secretary replied that these issues were examined in Bolangir and Puri districts and the information would be supplied to the Team. This data with respect to other districts as well, will be supplied in due course. Shri Baleshwar Nath next enquired as to how far the sub-soil water resources have been exploited. The Chief Secretary replied that there is only a negligible contribution of well supplies towards the irrigated agriculture in the State because of the sub-soil formation in the State and salinity below about 30 feet in inland areas. Even for drinking purposes tanks are used mostly. Artesian deep borings were examined and implemented. In Balasore district the response from the cultivators was rather poor. They wanted water free. This was, however, a human difficulty. The primitive processes of cultivation, inappropriate selection of land and the tendency of the people to go for other avocations to Calcutta and other industrialised places, were also responsible for the poor results. Upto now it has been a bad investment.

In Ganjam district, lift irrigation from rivers and *nallahs* has been done satisfactorily and people are asking for more water. Coastal cultivators too, are asking for pumped and tubewell water.

The area covered by a tubewell, the Chief Secretary added, varies from 60 to 150 acres. Electricity is given by the State Electricity Board at the rate of 9 nP. per unit. Running charges for 40 feet head, after allowing for depreciation *etc.*, come to Re. 1/- per acre inch. Capital investment would be almost Rs. 200 per acre. In delta area, running charges come to about 50 nP. per acre inch and cost per acre Rs. 100. Experts of the State Government would look to the running and maintenance for say 2 to 3 years and thereafter transfer the works to the beneficiaries. Technical advice would continue to be given by the State.

Supply of water to consumers on volumetric basis is an effective measure to check wastage, observed Shri Baleshwar Nath and suggested its trial in the State. If the maintenance is left with the cultivators, they will feel their responsibility and the wastage will automatically be checked, the Chief Secretary replied. He added, that their experience of the last 3-4 years shows that works maintained by the beneficiaries functioned satisfactorily.

Shri Baleshwar Nath enquired whether there was any soil erosion problem in the State. The Chief Secretary replied in the affirmative, and to counteract it, programme in Koraput district has been taken up, he added.

Regarding pisciculture, the Minister observed that in the Third Five Year Plan they have a bold fishery programme for which pilot scheme has been started. This will go a long way to solve the food problem and be a source of income to the Government as well. Since people are not accustomed to cultivate second crop after *kharif* paddy, they shall have to be made irrigation minded, to achieve the best utilisation results of the Minor Irrigation Schemes *etc.* On the issue of levy of irrigation cesses the Minister observed that people are prepared to pay water rates but may not be able to pay Betterment Fee.

To the query of Shri Baleshwar Nath as to how conditions in the State of Orissa compare with those in Sundarbans in West Bengal, the Chief Secretary said that after the rains the channels dry up and saline action starts taking place in them. Since they would be charging water rates, they do not expect any public participation in their maintenance. There are about 55,000 villages in the State, with an average population of about 350, added the Chief Secretary. The State is surplus in paddy to the extent of about 4 *lakh* tons and hope to improve the position further. Food habits of the people need to be changed and the Government has initiated the move in the Schools to begin with. Industrially, he added, the State is much backward. There are at present four industrial estates and 5 rural industrial estates. There is one Sugar Mill and 3 or 4 cold storages so far installed. Fish freezing needs to be taken up in the State.

Proper banking system is also to be provided for sound industrial and agricultural economy. Coconut production is stepping up and so also banana and arum. Formerly, only Brahmins could grow coconut.

The Chief Secretary added that about Rs. three *crores* were spent on Minor Irrigation works and their renovations in the State in the First and Rs. two *crores* in the Second Plan periods. Package deal, he said, did not provide for processing and marketing, which is an important feature.

Regarding levy of Betterment Fee in Orissa, mention by the visiting Team was made to the procedure adopted in Punjab State where advance recoveries have since been commenced on matured area. The recoveries were originally decided to be made on the cultivable commanded area, in thirty half-yearly instalments but later, as a *via media*, recoveries are being effected on the area matured. Similar action in Orissa too may solve their problem.

The meeting closed with a vote of thanks to the chair and the Leader and Members of the visiting Team.

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APPENDIX II

Committee on Plan Projects

(IRRIGATION TEAM)

Minutes of the meeting held at the Secretariat, Bhubneshwar, Orissa on 6th August, 1963.

The following were present:—

Orissa State

Shri Biren Mitra, Deputy Chief Minister.

Shri B. Sivaraman, ICS, Chief Secretary.

Shri V. S. Mathews, I.A.S., Commissioner, Panchayatiraj.

Shri L. K. Mahanti, Joint Development Commissioner.

Shri B. N. Sahu, Chief Engineer, R.E.O.

Shri H. K. Mohanty, Director of Lift Irrigation.

Shri B. K. Misra, I.A.S., Secretary, Revenue Department.

Shri S. B. Misra, Under Secretary, C.D. Deptt.

Shri H. Misra, Deputy Director, Agriculture (Horticulture).

Committee on Plan Projects

Shri M. Thirumala Rao, M.P., Leader, Irrigation Team.

Shri Baleshwar Nath, Member, Irrigation Team.

Dr. Arjan Singh, Member, Irrigation Team.

Shri Mahavir Prasad, Member, (ex-officio), Irrigation Team.

In attendance

Shri J. R. Kumar, Research Officer, Irrigation Team.

Shri P. C. Kalia, Engineer, Irrigation Team.

After welcoming the Team, the Chief Secretary apprised the Leader and members with the general agricultural development and the conditions which obtain in different parts of the State.

The Leader of the Team, Shri Thirumala Rao expressed concern about non-utilisation of water on State tubewells, built in recent years in the State. He observed that Panikoili tubewell visited by the Team, was completed in 1958 and irrigation commenced thereon in 1962. About 39 acres area was stated to be irrigated in 1962-63 out of which contribution of *mung* was 18 acres and groundnut 6 acres, which are almost rain-fed crops. The position is no better on other tubewells in Cuttack and Balasore area. The Chief Secretary replied that the cultivators of Orissa did not have experience of irrigation from tubewells so far. Moreover the soil near Panikoili tubewell was considered to be too poor to grow any crop other than paddy. He also explained at length the conditions prevailing in the State and difficulties experienced in regard to the multiple cropping. *Inter alia* he stated that Land Laws were not fully obeyed and most of the land owners were still charging rents at old rates.

The bias of some of the Panikoili cultivators against the usefulness of tubewell water went so high, said the Deputy Chief Minister, that the entire crop on the tubewell was got ravaged by letting loose a huge herd of animals in an organised raid.

Shri Baleshwar Nath enquired about the economy of tubewell projects. Shri Mohanty, Director, Lift Irrigation, replied that the tubewells and other lift irrigation schemes would be transferred to the individual Co-operative Societies formed on each scheme after the Government realised its investment in the course of 5—7 years.

Shri Baleshwar Nath said that it may be in the fitness of things, if such schemes are taken up after obtaining financial commitment and prior understanding from the intending co-operatives to utilise water. Besides, soil classification was also necessary before embarking upon costly lift irrigation programme. It was stated by the State Officers that soil classification has not been done in the State.

Dr. Arjan Singh raised the question as to why there was almost complete absence of winter cropping in the State. The Chief Secretary stated that very little research work had been done on double cropping and the evolution of suitable high yield paddy varieties. For this reason, season bound late varieties were grown, but now efforts are afoot to introduce early maturing varieties. This change in the growing period of *kharif* paddy will not only make it possible to raise a catch crop in the following three months (November, December and January), but also *Dalua* crop of paddy or groundnut from January to April. But in doing so, the age-old social pessimistic attitude to the *Zamindari* ridden and completely suppressed cultivators has to be changed. At present, there is hardly much urge in evidence to grow the second crop. However, administrative machinery has since been geared up and with the coordination of the concerned departments and persuasive efforts, area under *rabi* cropping is increasing. During the year 1962-63, two *lakh* acres were brought under *rabi* crop in the State, and with increased efforts, we may have more response from the cultivators this year. Groundnut in *rabi* season, is almost gaining ground. The Chief Secretary, however, revealed that it requires some re-thinking as to which of the crop should be encouraged or not instead of winter paddy.

Dr. Arjan Singh said that very good research work on the evolution of paddy varieties and crop utility had been done by the Central Rice Research Station at Cuttack. It should be possible to propagate the varieties recommended by this institute, particularly at places where perennial irrigation supplies are available. The Chief Secretary replied that perennial supplies in Orissa are limited. Wherever they are available, as in the Rushikulya Basin of Ganjam district, people have become irrigated agriculture conscious and are zealously utilising water.

Shri Thirumala Rao suggested importing Ganjam cultivators to settle in backward parts of the State to demonstrate better methods of agriculture to the cultivators.

Shri Baleshwar Nath pointed out that lack of water courses on the irrigation works is also a great hindrance in furthering *rabi* irrigation. The Chief Secretary said that in the Orissa Irrigation Act XIV, 1959, the beneficiaries have been made responsible for the construction and maintenance of watercourses. If they fail to discharge this obligation, watercourses would be constructed by the Government and the cost recovered from them as arrears of land revenue.

Dr. Arjan Singh pointed out that the stray cattle menace in the State during the winter months also stood in the way of enthusiastic cultivators to grow *rabi*. The Chief Secretary agreed with him and stated that the big cultivators were, by and large, opposed to the raising of any crop in winter by small cultivators. In support of this assertion he cited the instances of Kalahandi and Bolangir districts, where the winter crops of the cultivators, and even of Government Agricultural farm, were got deliberately grazed by the landlords by letting loose the herds of village cattle. The Member suggested that strict enforcement of Cattle Trespass Act together with propaganda drive organised by the *Panchayats*, may help considerably in eradicating this social evil. The Chief Secretary remarked that the animals of all villages were taken out for grazing by herds-men engaged jointly for this purpose. The problem may be solved to some extent if their period of engagement is extended by about 3 months.

Speaking further on the issue, the Chief Secretary said that price index plays an important role in agriculture. Purchase price of rice per maund by the Government of India for a particular variety of paddy of Ganjam district was about six rupees less than that fixed for the same popular variety in the adjoining area of Andhra Pradesh. Assured price is a great incentive to the cultivators. Purchase price policy should be equitable.

Orissa Government made a big departure from the set rules, said the Chief Secretary, in giving fertilizers and seeds on loan basis during the emergency even to non-members of Co-operatives. About Rs. 6 *lakhs* worth of these items were given, which loan has already been repaid to the Government. This year too this measure is being repeated.

The Members of the Team observed that some sub-standard type works seen by the Team, in most cases executed by the Revenue and Community Development Departments during the First and Second Plan periods, were in many respect not conforming to the P.W.D. specifications. The Chief Secretary said that the newly created Rural Engineering Organisation was looking into the works already executed. The Chief Engineer, Shri Sahu told that, so far it has been seen that bringing up of 1,170 derelict works in the State would require an expenditure of Rs. 3.39 crores, and with this, an extra area of 1,01,000 acres would be benefited. The original ayacut in 80 resurveyed cases he added, was found to fall short by about 23 per cent. Further re-surveying was in progress.

The Chief Secretary said that planning, execution and functioning of minor irrigation works irrigating 100 acres or more would be the responsibility of the Rural Engineering Organisation. The Leader, Shri Thirumala Rao expressed fear that the Planning and Co-ordination Department may not unduly interfere in the technical sphere of the Rural Engineering Organisation, creating bottlenecks in the Minor Irrigation Programme. The Chief Secretary assured that there will be no such thing.

Dr. Arjan Singh enquired whether State Government intended to take up consolidation of holdings. The Chief Secretary replied that since variation in soils even in the same village was considerable and the holdings were mostly small, the feasibility of consolidation of holdings had not been considered. Dr. Singh suggested that a few officers may be deputed to study the consolidation work in the Punjab State, where it has made considerable progress and then take up a pilot survey of a couple of villages to assess the possibility of initiating these operations.

Shri Baleshwar Nath next mentioned the problem of encroachment on the emergent tank bed area. On Krishna Sagar, out of the original tank bed area of 750 acres, about 400 acres area was encroached. It was stated that the State Government is looking into the matter. The original water spread area was not 750 acres. There were many aspects of the problem, the actual tank bed area after the last settlement, the Tenancy laws, and sometimes even political pressure.

Shri Baleshwar Nath suggested taking up investigations to irrigate from open wells which are at present rarely to be seen in the State. The Chief Secretary said that there may be the possibility of open well irrigation in Kalahandi and Bolangir districts which could be looked into.

Dr. Arjan Singh wanted to know about the progress of horticulture in the State. The Chief Secretary said that so far they had only a rudimentary programme in this sphere. They had now created a Horticulture Section under the Agriculture Department. Kuradhi area could become a good basis for horticulture operations, but people are not coming up.

Shri Baleshwar Nath next moved the issue of obstructions in the bed of streams in short supply periods, particularly quoting instance of one such obstruction about half a mile above the Hada diversion weir seen by the Team towards the end of March, 1962. The Chief Secretary replied that the Government is taking action in such matters. The riparian rights, however, are the limiting factors.

The meeting came to a close with a vote of thanks to the Chairman and the visiting Team.

APPENDIX III

Annual Rainfall Normal for 50 years (1901 *to* 1950) *Orissa State*

(Rainfall in inches)

Station			January	February	March	April	May	June	July	August	September	October	November	December	Total
Cuttack	..	..	0·54	1·08	0·82	1·35	3·41	8·75	14·10	12·44	9·02	5·80	1·84	0·21	59·36
Balasore	..	..	0·67	1·20	1·38	2·09	4·14	8·59	13·10	12·35	9·45	6·74	1·66	0·28	61·65
Puri	..	..	0·56	1·04	0·79	1·06	2·65	8·16	12·24	11·83	9·62	6·58	2·28	0·29	57·10
Sambalpur	...	..	0·56	0·96	0·64	0·69	1·21	8·60	18·48	16·97	8·82	2·42	0·58	0·14	59·07
Dhenkanal	..	..	0·61	1·21	0·73	1·13	2·34	8·27	15·10	13·12	8·68	3·69	1·00	0·18	56·06
Bolangir	..	..	0·55	0·72	0·55	0·73	1·14	9·20	15·40	16·04	9·12	2·58	0·62	0·14	56·79
Kalahandi	..	..	0·45	1·61	0·54	0·93	1·33	9·00	13·54	15·15	8·69	3·217	0·70	0·13	55·29
Keonjhar	..	..	0·87	1·50	0·88	1·70	3·50	8·24	15·4	13·20	9·11	4·44	1·25	0·20	60·29
Mayurbhanj	..	..	0·85	1·39	1·16	1·87	3·81	9·26	16·80	14·80	9·11	4·47	1·07	0·26	64·85
Ganjam	..	..	0·42	0·87	0·84	1·67	3·02	6·67	8·74	9·69	9·04	7·079	2·70	0·43	51·17
Koraput	..	..	0·26	0·44	0·64	2·11	2·98	8·10	14·00	15·00	10·32	4·41	1·41	0·29	59·96
Sundergarh	..	..	0·78	1·43	0·56	0·79	1·62	9·85	8·92	18·03	8·82	2·99	0·64	0·21	54·65
		Total	7·13	13·46	9·53	16·13	31·15	102·69	165·82	168·61	109·80	54·41	15·75	2·76	..
		Average	0·59	1·12	0·80	1·34	2·60	8·56	13·82	14·05	9·15	4·53	1·31	0·23	..

APPENDIX IV

A short note on Minor Irrigation Projects in Orissa during different Plan periods

During the First Plan period commencing from 1951 an amount of Rs. 270.04 *lakhs* has been spent to bring about an area of 2 *lakh* acres under Minor Irrigation.

During the Second Plan period, an amount of Rs. 149.71 *lakhs* has been spent out of Grow More Food Scheme, besides a sum of Rs. 189.62 *lakhs* under Community Development Sector to bring an area of 1.60 *lakh*—acres under Minor Irrigation. The achievement during the First and Second Plan period under Minor Irrigation has been reported to be 3.60 *lakh* acres. This is now under verification after actual ayacut survey. The correct figure will be arrived at after the detailed investigation is complete. A list showing 80 projects that have so far been verified is given below. The difference in acreage comes to about 23 per cent on an average.

List of Projects whose ayacut have baen verified after detailed Survey

Serial No.	Name of the Project	Recorded ayacut	Actual ayacut after verification
1	2	3	4
1	Sublaya	74	43
2	Kathakhunti	150	200
3	Khuntabandha	62	68
4	Kuahara	104	64
5	Arakhapalli	150	106
6	Chakradharprasad	160	26
7	Baladianuagaon	216	110
8	Katrajhari	753	753
9	Baunsiapada	500	500
10	Dewli	102	102
11	Sulia	1,500	1,500
12	Ketakajhari	50	50
13	Khanga Bandha	200	200
14	Kajala Ganda	820	600
15	Hada	2,000	2,000
16	Deras	2,200	1,000
17	Singhapada	600	400
18	Mohanguru	959	400
19	Baishnab Bandha	60	60
20	Ashoka Jhar	600	400
21	Dholpathara	500	500
22	Gabapal	500	500
23	Laxmibandha	600	600
24	Palaghasara	300	200
25	Sal Sala	800	400
26	Dhodei	300	200
27	Patrapada	2,200	2,000
28	Matalia	1,000	1,000

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1	2	3	4
29	Parbatia	180	180
30	Patrabaga	450	400
31	Baunsapokhari	1,000	500
32	Baradapal	2,000	2,000
33	Damasal	1,500	1,500
34	Budhi Khomori	200	200
35	Ralia Bundha	140	126
36	Bada Nalia	400	400
37	Kuliposh	200	200
38	Jampharia	300	300
39	Sri Rampur	300	293
40	Jhulan	160	160
41	Kapil	200	78
42	Tudra Sag Jodi	900	670
43	Sunamera Bandha	200	200
44	Dhal Pur Bandha	150	150
45	Jhipa Bandha	300	139
46	Ektali	200	140
47	Saranda M.I.P.	120	120
48	Ambadiha	316	214
49	Ranga Matia	120	90
50	Jaganath Khunta	300	80
51	Dig Dhar	500	180
52	Gobra Joda	300	180
53	Champa Jhar	500	500
54	Neduapal Bandha	600	200
55	Bisipur	200	120
56	Koradiaha Bandha	800	300
57	Basia	202	202
58	Bhursuan	100	100
59	Pipalnala	623	623
60	Kayakud	1,600	500
61	Bajori	400	300
62	Narsinghnath	847	845
63	Ruchidakata	150	150
64	Katarbaga	260	260
65	Bauriguda	350	250
66	Bandhapalli	640	420
67	Sanmachkandhanna	1,000	800
68	Tudaluga	200	200
69	Sarangagada	450	100
70	Madhujori	387	100
71	Gundhari	300	200
72	Rankia	225	200
73	Tenar	500	350
74	Lakshmijore	650	650
75	Gandharal	420	400
76	Dhatika	215	215
77	Bisipada	200	100
78	Tentuligarh	260	100
79	Karandimarka	75	75
80	Rayagadagedda	800	400
	Total	40,800	31,342

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During the Third Plan period, there is a provision of Rs. 3.04 *crores* under Minor Irrigation under Agriculture Sector with a target to bring about an additional area of 1.20 *lakh*-acres under Minor Irrigation. Besides this, it has also been proposed to bring about 1.50 *lakh* acres under Minor Irrigation out of Community Development Sector which totals to 2.70 *lakh* acres under Minor Irrigation during the Third Plan period.

Subsequent to the change of programme and increased target due to National Emergency, the programme has been revised to bring about an additional area of 50 per cent of the target under Agriculture Sector. Thus it has been proposed to increase the target to 3.60 *lakh*-acres during the Third Plan period which includes 2.10 *lakh*-acres under Agriculture Sector and 1.50 *lakh*-acres under Community Development Sector. An area of 0.60 *lakh*-acres has been included under Lift Irrigation under the Programme of Agriculture Sector.

Besides the above, it has also been proposed to renovate 1,170 derelict projects to bring about an additional area of 1.01 *lakh*-acres under Minor Irrigation. Thus the total target under Minor Irrigation excluding Lift Irrigation during the Third Plan period is 4.01 *lakh*-acres.

During the first and second years of Third Plan period, an area of 74,000 acres has been brought under Minor Irrigation and the balance has been proposed to be achieved during the remaining three years of Third Plan period.

It has been decided by the Government after careful consideration that all the projects having more than 100 acres ayacut will be executed directly through an Engineering Organisation which has been set up for execution of Minor Irrigation Projects.

A programme for achievement of 3.27 *lakh*-acres under Minor Irrigation during the balance period of Third Plan period has been chalked out in detail and year-wise programme is as given below:—

1963-64	..	75,000 acres
1964-65	..	1,50,000 ,,
1965-66	..	1,02,000 ,,
Total	..	3,27,000 acres

In order to create the potential of 75,000 acres as proposed by the beginning of the next irrigation season, a detailed programme of works to be taken up has been worked out. It has also been proposed to spend Rs. 172 *lakhs* under Minor Irrigation during the current financial year, out of which Rs. 96 *lakhs* has been proposed from the Community Development Sector and the balance of Rs. 76 *lakhs* has been proposed to be spent from the Agriculture Sector.

In order to achieve the target smoothly, the procedure for investigation, execution and maintenance of Minor Irrigation Projects has been revised by the Government. A new set of Irrigation Rules has been framed and passed by the Legislature which allows for fixing the exact ayacut of an Irrigation scheme after thorough survey.

Now since as per the Irrigation Rules the period of supply has been clearly distinguished by indicating acre-inches of supply for ayacut for every month, instructions have been issued to translate this into calculation in order to find out the maximum capacity of reservoirs including the number of fillings.

According to the new Irrigation Rules, each project has to be classified on which depends the rate of levying the Irrigation Cess. As such instructions have been issued to record the flow in the streams. It is necessary to indicate minimum flows during the rainy season and whether the flow is continuous or not. Observance of the flow during the months of October, November and December is essential for the *kharif* crop in the State.

As per Irrigation Rules, the Project after investigation and preparation of detailed plans and estimates will be sent to the Block Development Officer for inviting objections and suggestions from the public giving seven days time. After objections and suggestions are received through the Collector, it will be thoroughly scrutinised and any modification, if necessary, will be made before the project is taken up for execution. The projects having more than 100 acres ayacut have been proposed to be executed by the Engineering Agency through regular contractors having good knowledge about plans, specifications *etc.* The projects having less than 100 acres ayacut, if they do not involve much of technical skill, have been proposed to be executed through the agency of *Gram Panchayats.*

While preparing the list of projects for execution during the balance period of the Third Plan, it has been emphasised to give priority to the renovation of derelict projects and providing proper distribution system to all projects, to achieve the target more easily in the quickest possible time. It is observed that the utilisation of the created potential decreased due to lack of proper distribution system and maintenance. Therefore, it has been emphasised to construct the distribution system more systematically by providing outlets for each block extending from 50 to 100 acres. It has also been noticed in some cases that there is some mis-utilisation and wastage of water due to lack of construction of field channels and also lack of proper control on distribution of water. Therefore, it has been proposed to construct field channels for each project wherever after the due notice the villagers failed to do it themselves. The fall board shutters are being replaced by screw gear shutters. *Khalasis, Laskars* and Patrols are being appointed for proper control and distribution of water at various key points. Irrigation charts are being drawn up.

As per new Irrigation Rules enforced in the State, the field channels are to be constructed by the beneficiaries failing which the *Gram Panchayat* or the Department will take up the execution of the field channels at the cost of the beneficiaries. Accordingly it has been programmed to prepare the plans and estimates of field channels for 100 Minor Irrigation Projects throughout the State during the current year which are being handed over to the concerned Block Development Officers to impress upon the beneficiaries for the construction of the same.

During the Third Plan period there is a provision of Rs. 304 *lakhs* under Agriculture Sector and Rs. 374 *lakhs* under Community Development Sector. Due to the increased target under Minor Irrigation arising out of the National Emergency, the requirement of funds has been increased to Rs. 14.01 *crores* including the provision under Community Development Sector. Thus, the additional fund required to be supplemented by the Centre is Rs. 7.23 *crores.*

LIFT IRRIGATION

In order to solve the food problem, much emphasis has been laid on increased food production not only by increasing the present yield but also by growing more than one crop on the same piece of land. The limiting factor for growing more than one crop (double or triple crop) is lack of perennial irrigation facilities. At present double crops are grown by irrigating through the indigenous "*Tenda*". This method is highly inefficient and is unable to cope with the present need. With a view to ensure adequate supply of water to meet the present demand and to intensify the Agriculture and Food Production programme, a separate Directorate of Lift Irrigation has been set up to look after investigation, execution and maintenance of all the Lift Irrigation Projects in the State.

Flooded tracts and lands situated on higher contours which provide suitable cultivable lands for growing cash crops can be best served with lift irrigation at a reasonable cost within the shortest possible time. Power generated from Hydro Electric and Thermal Stations will be sufficient to cover the lift irrigation area and the programme of Rural Electrification can be successfully implemented where lift irrigation is taken up concurrently. Although diesel pump is costly, even than in some of the remote areas where the transmission lines for the electric grid have not reached, mobile diesel pumping sets are being fully utilised under the Lift Irrigation Programme.

In order to provide continuous water supply to the cultivators for increasing their food production, areas have been selected where there are facilities for shallow or deep tube wells and where flow irrigation is not possible. Due to scattered holdings and financial and other difficulties, it is not possible that one pump can be owned by a single cultivator. The other alternative is that a group of cultivators may not have sufficient funds to own a pump by cash payment. In order to obviate these difficulties, formation of Lift Irrigation Co-operative Societies are being encouraged. The Directorate after investigating ground water supply, examining the supply from perennial rivers and streams and determining the commandable area, executes the schemes. Thereafter Lift Irrigation Co-operative Societies are formed comprising the persons who own the lands within the commandable area of the pumps with a view that they will eventually take over and run the pumps.

In the ensuing Assembly Session, a Bill is going to be introduced to amend the Co-operative Act in order to bring the Lift Irrigation Co-operative Societies into its fold.

Although under the Agricultural Sector, an area of 0.60 *lakh*-acres was included under Lift Irrigation system, considering the present need this target was revised. A programme to cover two *lakh*-acres, both by direct pumping from perennial rivers or streams and by tapping underground water resources by filterpoint tubewells, has been drawn up.

During the first two years of the Third Plan 27,500 acres have been brought under Lift Irrigation. In order to achieve the balance of 1.725 *lakh*-acres under Lift Irrigation during the Third Plan period, the following detailed year-wise programme has been drawn up.

1963-64	40,000 acres
1964-65	60,000 acres
1965-66	72,500 acres
Total	1,72,500 acres

Where the river or stream is perennial, the system of floating barge on which pump sets are mounted, has been introduced.

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APPENDIX V

Statement showing cost per acre of the various types of Minor Irrigation Works visited by the Team

Serial No.	Name of the project	Year of construction	Ayacut (CCA) (Acres)	Cost of the project (Rs.)	Capital cost per acre (Rs.)	Actual irrigation (acres)	Effective cost per acre (Rs.)	Remarks
1	2	3	4	5	6	7	8	9
			DIVERSION WEIRS					
1	Champikote	1936 (original) (As per proposed renovation)	1,200 2,110	N.A. 1,90,000	N.A. 90	.. ..	.. ..	Apart from the fixed ayacut some irrigated area is escaping assessment. (*Para 2·119*).
2	Matalia	1950-51 (As per proposed renovation)	4,050 4,050	2,94,000 1,25,950	73 110	860 ..	368 ..	Utilisation is just about 20 per cent at present. (*Para 2·59*).
3	Hada	1951/1956-57	1,750	2,82,580	161	600 (1960-61)	471	Even up to five years after construction of the weir, channel length of 5,800 ft. could be constructed against the sanctioned length of 12,840 ft. (*Para 2·76*).
4	Susab	1951 CCA Annual irrigable	750 475	14,390	19	474	..	(*Paras 2·36 and 2·37*).
5	Kuradhi	1954-55	8,100	52,74,000 Revised estimate	652	..		The project was planned to irrigate 9,000 acres area with an expenditure of Rs. 9·5 lakhs. On resurvey the project cost has risen to 52·74 lakhs and area served would be 8,100 acres. (*Para 2·11*).
6	Thelkonali	1951 CCA Annual irrigable	1,500 1,415	21,416	15	1,415·16	..	(*Para 2·46*).

7	Pandarijore	1954-55	560	1,42,000 Revised estimate	254	No irrigation so far done	..	Project taken up for construction in 1954-55 is still incomplete. (*Para 2·104*).
8	Naikenjore	1957	700	62,000	89	350	178	Due to land acquisition problem construction of canal could not be completed. Hence irrigation could not be developed.
9	Lakshmijore	1954	600	89,365	183	300	298	The project is just irrigating half of the targeted area. (*Para 2·96*).
10	Bhainsa	1955-56	453	14,500	32	N.A.	..	No canal system yet constructed. Field to field irrigation is being done. Canal and field channels need to be constructed. (*Para 2·90*).
11	Krandimaska	1955-56/1960-61 ..	200	37,800	55	N.A.	..	Work was found in neglected condition. (*Paras 2·70 and 2·71*).
12	Sanmachkandhanna ..	1955-56 (Original) ..	800	1,12,000	143	N.A.	..	Due to paucity of technical know how with the Revenue Department, full potentialities had not been properly exploited. Renovations are expected to cost Rs. 2·46 lakhs and the ayacut will increase from 800 to 2,000 acres. (*Paras 2·20 & 2·23*).
		(Proposed renovation) ..	2,000	2,46,000	168	..	..	
13	Jaymangal	1957	1,550	2,99,500	193	No irrigation done so far.	..	Due to land acquisition problem the canals could not be built and the project remained unproductive both for the State Government and the farmers. (*Para 2·88*).
14	Patrabhaga	1957-58/1960-61 ..	800	70,404	88	No irrigation done.	..	Apparently the canal system is defective and needs to be technically scrutinised. (*Para 2·33 and 2·34*).

APPENDIX V—*contd.*

1	2	3	4	5	6	7	8	9
15	Vakrada	..	..	37,000	..	..	..	Design of new weir found faulty by the R.E.O. Expenditure of Rs. 14,000 had been incurred when further construction was stopped. *(Paras 2·128 & 2·129).*
16	Byjalgadda ..	..	..	33,000	..	..	..	The R.E.O. has, it is understood abandoned the project on which the Revenue Department had incurred an expenditure of about Rs. 7,000. *(Para 2·132).*
17	Suini	(Originally constructed by Ex-Kalahandi Durbar).	2,700	..	..	..	..	The project constructed in pre-Zamindari system is to be provided with distribution canals estimated to cost Rs. 2,20,480. *(Para 2·109).*
		(Distribution system planned now)	..	2,20,480	82	No irrigation done so far.		
		RESERVOIRS						
18	Katrajhari	(Reconditioned by the erstwhile Nayagarh Durbar in 1932-33).	753	N.A.	N.A.	N.A.	..	The project is stated to be irrigating 1028·22 acres. Annual charge @ Re. 1 per acre is being levied on 753 acres. Thus an area of 275·22 is escaping assessment. *(Para 3·22).*
		(Renovated by the Revenue Department in 1956).	753	49,941	66	1028·22	..	
19	Krishna Sagar ..	1890	5,113·74	N.A.	N.A.	4,000 (approx.)	..	Tank is badly silted up and about 400 acres tank bed area which is out of submergence is stated to be under unauthorised occupation. Area of serviceability has shrunk. *(Paras 3·41 and 3·44).*

20	Brindaban Sagar ..			..		N.A.	N.A.	N.A.	N.A.	..	The entire tank bed area is silted up and is under cultivation. (*Para 3·51*).
21	Krishna Chandra Sagar	1942-43	..	..	..	400	40,000	100	321·85 Kharif 20·00 Rabi	..	(*Paras 3·57 and 3·58*).
22	Asha Sagar			..		N.A.	N.A.	..	..	..	Besides serving domestic use, it irrigates Arkabali Seed Farm. (*Para 3·74 and 3·75*).
23	Narain Sagar ..			..		..	..	..	..	..	An old Zamindari tank. Came in the charge of the Revenue Department after abolition of Zamindari system. Surplus channel needs remodelling. Another tank named Krishnasagar upstream served as silt trap which however lies breached and may not be necessary to be retained for silt trap purpose. (*Para 3·32 and 3·34*).
	PLAN PERIOD RESERVOIRS										
24	Deras	1947	..	..	..	2,000	13,99,934	700	..	..	Original cost per acre is higher than the conventional criteria fixed for reservoirs. (*Paras 3·4 & 3·6*).
25	Bhatrajore	1955	..	..	..	4,000	13,35,560	344	N.A.	..	Huge scour and retrogression necessitated reconstruction of waste weir costing Rs. 6,19,651, thus raising the original cost of the project to more than double. 36 sq. miles catchment with 60 inches annual rainfall can command about 7,000 acres area. The project needs to be resurveyed. (*Paras 3·64 and 3·59*).

APPENDIX V—*concld.*

1	2	3	4	5	6	7	8	9
26	Karlakata	1950-51	1,520	57,553	38	200 (Approx)	288	Catchment of 2·60 sq. miles cannot irrigate as much area as envisaged. (*Para 3·81*).
27	Panchmohla	1955-56	120	1,500	13	No irrigation so far.	..	The bund lies breached since 1958. (*Para 3.96*).
28	Sitagudri	1960-61	..	36,000	..	N.A.	..	It is a small project with 1·12 sq. miles of catchment. No irrigational data supplied. (*Para 3·90*).
29	Bakrata	Original	N.A.	N.A.	N.A.	N.A.	..	No technical data supplied, Due to unsound rock foundation the waste weir was reconstructed in 1959 at a cost of Rs. 15,000. (*Para 3·78*).
	TUBE WELLS & LIFT IRRIGATION SCHEMES							
30	Panikoili Tubewell ..	..	200	50,000	500	39	1,305	Tubewell constructed in 1958, started irrigation in 1962-63. (*Para 4·19*).
31	Rayagada Lift Irrigation Scheme.	..	800	2,02,290	253	420	481	Scheme commissioned in December 1960. Irrigation in 1963-64 was 420 acres. (*Para 5·40*).
32	Nagavali Co-operative Lift Irrigation Scheme.							
	(*a*) Chekkaguda ..	..	434	2,51,161	496	131	1,642	131 and 240 acres is average irrigation for the years 1959-60 and 1960-61.
	(*b*) Thummiguda ..	..	400	2,27,143	568	240	947	(*Para 5·21*).

APPENDIX VI

District-wise requirement of funds for improvement and renovation of disuse Minor Irrigation Projects

Serial No.	District	No. of Projects	Extra acreage	Amount required
1	2	3	4	5
1	Cuttack	40	5,500	20,19,000
2	Puri	150	6,500	19,84,200
3	Balasore	62	1,700	5,14,000
4	Mayurbhanj	61	5,000	14,99,300
5	Sambalpur	90	10,000	32,32,000
6	Sundargarh	55	7,000	21,52,000
7	Dhenkanal	46	10,000	33,91,233
8	Keonjhar	49	6,300	19,55,000
9	Ganjam	252	30,000	1,10,90,000
10	Phulbani	60	4,500	16,68,000
11	Kalahandi	60	6,500	20,04,300
12	Koraput	110	4,000	11,88,500
13	Bolangir	135	4,000	12,03,567
	Total ..	1,170	1,01,000	3,39,00,000

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